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13

GENERAL DATA

ON

LAKE SUPERIOR-MISSISSIPPI RIVER CANAL

REPORT

BY

GOVERNMENT ENGINEERS C. L. POTTER,
F. R. SHUNK, AND E. D. PEEK

UNDER

House Resolution No. 460

April 24, 1914.—Ordered to be printed

WASHINGTON
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1914

House Resolution 460, Sixty-third Congress, Second Session.

RESOLUTION.

Resolved, That there shall be printed as a House document eighteen hundred cop of a report made by Government Engineers C. L. Potter, F. R. Shunk, and E. Peek, and designated as General Data on Lake Superior-Mississippi River Canal

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General data on Lake Superior-Mississippi River Canal.

ELEVATIONS.	F
Lake Superior	601
Mississippi River at Hastings, 2½ miles above mouth of St. Croix River:	
Lowest	668
Highest	687
Mississippi River at St. Paul, Minn.:	
Lowest	682
Highest	703
Mississippi River at Washington Avenue Bridge, Minneapolis:	
Lowest	718
Highest	728
With dam finished—	
Lowest	723
Highest	731
Summit level of proposed Brule-St. Croix Canal:	
Low water	1,012
High water	1,01

DISTANCES.	M
Duluth Canal to Bear Creek	
Bear Creek to Prescott (length of canal)	2
Length of Summit level	
St. Paul to Prescott	
Minneapolis to Prescott	
Minneapolis to Taylors Falls (open-river portion)	
Minneapolis to Duluth Canal	2

RELIMINARY EXAMINATION OF WATERWAY, LAKE SUPERIOR TO THE MISSISSIPPI RIVER.

United States Engineer Office,
Canal Park,
Duluth, Minn., May 14, 1913.

om: Board of Engineers, Duluth, Minn.
o: Chief of Engineers United States Army, Washington, D. C.
ubject: Preliminary examination of waterway, Lake Superior to the Mississippi River.

1. The board of officers of the Corps of Engineers, constituted Special Orders, No. 19, War Department, Office of the Chief of ngineers, Washington, August 14, 1912, for the purpose of making preliminary examination and report thereon for a waterway from ke Superior to the Mississippi River by way of Allouez Bay, at the esterly end of the Duluth-Superior Harbor, and the Amnicon, oose, and St. Croix Rivers, Minn., and Wis., met January 14, 1912, Duluth, Minn., on the call of the senior member; held a public aring on January 15; and adjourned on the 16th to await further omised information. The board again assembled on May 14, 13, at St. Paul, Minn., considered further matters, made its report, ad adjourned sine die.

2. The board submits the following report:

3. The river and harbor act of July 25, 1912, provides for the fol- wing preliminary examination:

> aterway from Lake Superior to the Mississippi River by way of Allouez Bay, at easterly end of the Duluth-Superior Harbor, and the Amnicon, Moose, and St. ix Rivers, Minnesota and Wisconsin.

PREVIOUS REPORTS.

. Three reports have previously been submitted on the question a waterway from Lake Superior to the Mississippi River.

. The river and harbor act of August 17, 1894, contained the owing clause:

> or examination and survey for the location of a canal connecting Lake Superior the Mississippi River, $10,000; and the engineers making said examination and ey shall report the most feasible route for such canal, either by way of the Saint x, Rum, or Upper Mississippi Rivers: *Provided*, That nothing herein shall be con- ed to commit the Government to proceed with the construction of said improve- t.

. This duty was assigned to Maj. Sears, Corps of Engineers, ose report is published in House Document No. 330, Fifty-fourth gress, first session, and also as Appendix HH 12, Report of the ef of Engineers, 1896. In compliance with the working of the , which precluded an opinion as to whether the improvement was

commercially justifiable or actually feasible, Maj. Sears confined hin
self to the question of relative feasibility and reported that the mos
feasible route for a canal connecting Lake Superior and the Missi
sippi River is from Alluoez Bay via the Brule and St. Croix Rivers.

7. The river and harbor act of March 3, 1899, contained the fo
lowing clause:

> Lake Superior and Mississippi River: The report upon the examination a
> survey for the location of a canal connecting Lake Superior and the Mississippi Riv
> provided for by the river and harbor act of 1894, shall be supplemented by a furth
> report as to whether such canal is feasible and an improvement which should be u
> dertaken by the Government, and, if feasible, the probable cost of constructio
> operation and maintenance of the same.

8. This duty was also assigned to Maj. Sears, whose report, su
plemental to the preceding one, is published in House Docume
No. 69, Fifty-sixth Congress, first session, and also as Append
KK 10, Report of the Chief of Engineers, 1900. His conclusio
concurred in by the division engineer and the Chief of Enginee
was that the improvement was not one which should be undertak
by the Government.

9. The river and harbor act of March 3, 1909, contained the fo
lowing clause:

> The report upon the examination and survey for the location of a canal connecti
> Lake Superior and the Mississippi River by way of the St. Croix River, as provided
> the river and harbor act of 1894 and as supplemented by the provisions of the ri
> and harbor act approved March 31, 1899, shall be completed by a further report
> to whether existing conditions render such project now feasible and practicab
> considering the necessary location, plans, cost of construction and maintenan
> commerce affected, and water supply.

10. The report on this subject was submitted by Lieut. Col. G.
Fitch under date of August 30, 1909, and is printed in House Doc
ment No. 304, Sixty-first Congress, second session.

11. The conclusions of the district engineer were as follows:

> In view of the existence of four competing lines of railroad between the termi
> of the longer route and much longer time of transit for freight, of the shortness of
> navigation season, of the high cost of construction and maintenance, of the very li
> ited amount of probable local traffic, and of the uncertainty of any through traffic
> the canal if built, I am of the opinion that its construction is not worthy of be
> undertaken by the General Government.

12. Those of the Board of Engineers for Rivers and Harbors:

> Answering the questions propounded in the act, the board reports that in its op
> ion, while existing conditions render such a project feasible and practicable from
> engineering point of view, the canal is impracticable from a commercial viewpo
> when consideration is given to location, plans, cost of construction, and maintenan
> commerce affected, and water supply, and therefore it is not advisable for the G
> eral Government to undertake the work.

13. And those of the Chief of Engineers:

> I concur with the district officer, the division engineer, and the Board of Engin
> for Rivers and Harbors that, while existing conditions render such a project practica
> from an engineering point of view, it is commercially impracticable, and that i
> not now advisable for the General Government to undertake the work.

14. The first act provided for finding the most feasible route fr
Lake Superior to the Mississippi River without considering its wort
ness. The second act provided for an examination as to whether
not the selected route was feasible from a commercial standpoint.
was held not to be. The third act provided for a resubmission of

ase under possible changed conditions. It was still held to be nworthy.

OUTLINE.

15. The act requiring the present report confines the scope of the oard to a modification of the Brule-St. Croix route, which had been reviously reported as most feasible. This modification consists in ollowing the route via Allouez Bay, the Amnicon and Moose Rivers o the St. Croix, in place of the Brule and Upper St. Croix Rivers. oth routes follow the same line from Allouez Bay to the Amnicon iver and from the mouth of the Moose River to the Mississippi River. ttention is invited to the accompanying map and profile, and par-cularly to report (Appendix A) of Junior Engineer G. A. Taylor, ho was in charge of the field party gathering information and data r the new portion of the route. Some of the conclusions stated are ken from Mr. Taylor's report direct.

DESCRIPTION OF THE ROUTE.

16. Beginning at the eastern end of Allouez Bay, in Duluth-uperior Harbor; thence for a distance of 5½ miles in an easterly rection to the Amnicon River, at an elevation of 61 feet; thence r 14½ miles up the Amnicon River to a point 582 feet above Lake uperior; thence for 6 miles south across the divide, which is 630 et above Lake Superior, to the Moose River; thence 9 miles down e Moose to the St. Croix River, 385 feet above Lake Superior; and ence down the St. Croix for 149½ miles to its junction with the ississippi River, 65 feet above Lake Superior.

17. The total rise from Lake Superior to the summit is 630 feet, d this point is 565 feet above the Mississippi at the mouth of the . Croix, making a total rise and fall of 1,195 feet to be overcome tween Lake Superior and the Mississippi River.

WATER SUPPLY.

18. By reason of its primary importance the question of water sup-y for the summit level of the proposed canal was given particular aention.

19. The examination by Mr. Taylor, fully described in his accom-nying report, with maps and profile, shows the summit level for t crossing from the Amnicon to the Moose River to have an avail-ale watershed of only 65 square miles, sufficient with average rain-fl to furnish a flow of 93 second-feet for six months in the year. A recent investigation of the run-off of the whole St. Croix Valley abve St. Croix Falls shows that for a year of practically normal rnfall (the discharge being measured continuously by the electrical pver generated) there was 22 per cent run-off. This, with Mr. Tay-lo s estimate of 30 inches rainfall, would amount to 8 inches instead his 0.8 feet, showing that his figure is not too small.

0. Outside this limited watershed the land slopes away, and no portunity was found for a feeder to augment the summit supply. T summit is about 200 feet above the headwaters of the St. Croix the east and 50 to 70 feet above the Black River on the west. B a computation similar to that followed on pages 13 to 18, House

Document No. 330, Fifty-fourth Congress, first session, it is foun that the summit level water supply for a barge canal must be 21 second-feet, if 40 lockages are made per day. Mr. Taylor estimat the available supply at 93 second-feet, and that is probably large.

CONCLUSION.

21. The board therefore feels justified, without further discussio in stating the following facts and conclusions:

(*a*) A feasible route from the engineering standpoint had alrea been found for a canal connecting Lake Superior and the Mississip River via the Brule and St. Croix Rivers.

(*b*) The route prescribed in the act of July 25, 1912, adds the di ficulty of about 210 feet additional height of summit level, calling f probably 20 more locks.

(*c*) The Amnicon and Moose Rivers carry much less water than th Brule and Upper St. Croix, and therefore the possible water-pow development would be smaller.

(*d*) The Amnicon River is much less favorable to canalization th the Brule. (See Appendix A.)

(*e*) Even with a limited use of the canal (40 lockages per day), t natural water supply available to the summit level is not half enoug and to provide the necessary water expensive pumping plants mu be furnished and operated.

(*f*) The small local population which could be benefited by t canal is along the Brule and St. Croix rather than along the Amnic and Moose.

(*g*) The only advantage to offset these disadvantages is a reducti in length of 25½ miles.

(*h*) The disadvantages far outweigh the advantage.

(*i*) The route specified in the act is not feasible from an engineeri standpoint.

(*j*) The locality in question is not worthy of improvement by t General Government.

22. The Committee on Rivers and Harbors of the House of Rep sentatives, United States, passed on January 13, 1913, the followi resolutions:

> *Resolved, by the Committee on Rivers and Harbors of the House of Representati United States,* That the Board of Engineers for Rivers and Harbors created by sect 3 of the river and harbor act approved June 13, 1902, be, and it is hereby reques to reexamine the report on a preliminary examination of canal connecting L Superior and the Mississippi River by way of the St. Croix River, Minnesota Wisconsin, printed in House Document No. 304, Sixty-first Congress, second sessi and report thereon.

23. On January 23, 1913, the Chief of Engineers referred t resolution to this board for consideration and report. This is assum to open up the whole question of advisability of a canal connecti Lake Superior with the Mississippi River via the Brule and St. Cr Rivers.

ROUTE.

24. The route to be considered is that via the Brule and St. Cr Rivers and described in House Document No. 304, Sixty-first C gress, second session, as follows:

By this route the northern terminus of the proposed waterway is Bear Creek on louez Bay, the southeasterly portion of Duluth-Superior Harbor. Thence for a stance of 21.58 miles in an east-southeasterly direction there is a canal link to the ule River 356 feet above Lake Superior. The canalized Brule River is then followed 10 miles to the summit level, which is 416 feet above Lake Superior and 351 feet ove the Mississippi at the mouth of the St. Croix. This level follows the general ection of the Brule River and finally, through a short excavated trench, reaches per Lake St. Croix, 12.73 miles from the north summit lock. About 20.77 miles low the northerly end of upper Lake St. Croix is the south summit lock. Thence route is along the canalized St. Croix River for about 17 miles to a point about -half mile below its confluence with the Namakagan River. Thence slack-water igation is proposed for the St. Croix River and St. Croix Lake to the southern ternus, Point Prescott on the Mississippi River, 30 miles below St. Paul, except that short canal links will be required, one 5 miles long around Kettle Rapids and one 00 feet long at Taylors Falls. The total length of the waterway by this route is 210 les and the total lift (up and down) is 767 feet. This may safely be considered the st feasible route; otherwise another survey would be required, and it is not probe that such survey would result in the recommendation of any material change he location of the canal.

SIZE OF CANAL.

25. Three kinds of canal have been considered—a ship canal, a amboat canal, and a barge canal. One of the most important conerations in a canal is the supply of water to the summit level, ich is drawn upon for operation whenever lockages are made, and evaporation, leakages, and filtration at all times. A careful dission of the water available to the summit level of this canal was de by Lieut. C. H. McKinstry, Corps of Engineers, in 1895, and olished as Exhibit H of report of Maj. Sears in House Document . 330, Fifty-fourth Congress, first session. The conclusion was ched that the summit level supply was entirely inadequate for a p canal, probably inadequate for a steamboat canal, but sufficient a barge canal of the dimensions suggested.

6. At the public hearing, January 15, 1913, many depths were gested—8, 10, 12, and 14 feet. The junction of this canal with Mississippi River can not be considered as in any sense its comrcial terminus. At that point is the small town of Prescott, Wis. pulation about 1,000), and a few miles up the river the town of stings, Minn. (population about 4,000). Neither of these is likely become a large railroad center. The object of the canal is to ain through water transportation from Lake Superior to St. Paul Minneapolis and to points lower down on the Mississippi River. existing project for navigation of the Mississippi River from neapolis to St. Louis provides for 6 feet at low water, and there ttle prospect of any increase in this project depth. It can scarcely argued that a transshipment would be made at Duluth from lake sels (for which no canal can be built on account of lack of water he summit level) to deep-draft barges for the canal and another sshipment at Prescott to the shallow barges which must finish trip to any large market or center of population.

7. It should thus be definitely settled that a ship canal from Lake erior to the mouth of the St. Croix River is out of the question, that, for any future time which the board considers within reason, depth for a canal should be that now fixed by the Upper Missisi River project, or 6 feet, and no more.

8. It then becomes a question between a steamboat canal and a ge canal. With the water supply at the summit level very

doubtful for a steamboat canal, and with no estimate of the cost such a canal, the discussion will be primarily confined to a bar canal of 6 feet depth, with 16 locks and 8 hydraulic lifts, 59 fe bottom width and 80 feet top width, and locks 170 by 35 feet, wi 6 feet of water on the miter sills. This is the canal discussed House Document No. 304, Sixty-first Congress, second session.

COST.

29. Such a canal was estimated in 1909 to cost $7,815,000 for co- struction and $420,000 per year for operation, maintenance, a 3½ per cent on the investment. There is certainly no change in co- ditions in the past three and one-half years which would warran reduction in these estimates. They will be accepted, but if a doubt exists it must be as to their being high enough.

PROBLEM.

30. Will the saving in freight to the public on the probable co- merce through the canal be equal to the $420,000 annual expense the Government for operation, maintenance, and interest on investment?

PROSPECTIVE COMMERCE.

31. At the request of the board the Minnesota Railroad and Wa- house Commission has furnished statistics of the amount of s material as might go by water, hauled during the year ending Ju 1912, by the four railroads connecting Duluth-Superior with M neapolis and St. Paul.

[Amounts in short tons.]

Name of road.	Hard and soft coal and structural iron shipped from Duluth, Minn., and Superior, Wis., to St. Paul, Minn., transfer, and Minneapolis.	Flour ship from St. Minn., tra and Minn olis to Dul Minn., an perior, W
Great Northern Ry. Co	694,115	1
Northern Pacific Ry. Co	1,089,105	11
Chicago, St. Paul, Minneapolis & Omaha Ry. Co	138,321	
St. Paul, Minneapolis & Sault Ste. Marie Ry. Co	33,027	
Grand total	1,954,568	22

32. From reliable estimates furnished by railroad authoritie appears that the above freight is about 80 per cent of the t freight handled by the roads, the balance being grain and gen merchandise or package freight. The table carries only the freight.

33. As to the amount of local freight which would be handled the canal, the following table shows the number of inhabitant the counties which the canal would pass through or touch:

County and State.	Square miles.	1908 population.	1910 population.
Douglas, Wis. (exclusive of Superior)	1,289	5,115	7,038
Burnett, Wis.	881	9,261	9,026
Pine, Minn	1,444	[1] 14,869	15,878
Chisago, Minn	452	[1] 14,341	13,537
Polk, Wis	933	20,885	21,367
Washington, Minn	430	[1] 28,884	26,013
St. Croix, Wis	711	26,716	25,910
Pierce, Wis	543	23,433	22,079
Total	6,683	143,504	140,848

[1] Figures for population for 1905.

34. This table shows that three counties have increased in popu-
ation, five have decreased, and the entire district has lost in popu-
ation during the period from 1905 and 1908 to 1910. From this it
s evident that the country is not at present a growing community,
while the cities at the extremities of the line are. The density of
population in the canal counties is 21 per square mile, while that of
he entire United States in 1910 was nearly 26 per square mile.

35. The population of the cities at the termini of the canal in 1910
was as follows:

Duluth	78,466
Superior	40,384
St. Paul	214,744
Minneapolis	301,408
Total	635,002

36. The population of the canal counties (and many of the inhab-
ants of these counties could not use the canal) is approximately 22
er cent of the population of the terminal cities.

37. The canal will be discussed under the assumption that it is to
e a waterway between the Twin Cities and the Head of the Lakes
nd will also serve the local population between the Head of the Lakes
nd the mouth of the St. Croix River. The freight between the
erminal cities is large and serves a large population beyond the
win Cities. For example much of the coal from Duluth-Superior
St. Paul-Minneapolis goes southward and westward to many small
owns. To increase the estimate of shipments of coal by 22 per cent,
n account of the local population along the canal, favors the canal
ore than it deserves, but such increase will be assumed, since the
ctual population to be served by the canal is unknown; the popula-
on of the Twin Cities is the only figure available and represents the
inimum to be served at the southern end.

38. The freight which may come from the east via the lakes and
to point south of the mouth of the St. Croix River along the Mis-
ssippi River is limited. La Crosse, Wis., and Winona, Minn., are
e first cities of importance and their combined population is only
per cent of that of St. Paul and Minneapolis. Besides, they are
obably in Chicago territory rather than in Duluth-Superior terri-
ry, even if the canal be built. The assumed basis is therefore
obably more than fair to the canal.

39. The railroads were requested to separate the figures furnished
the railroad and warehouse commission showing the bulk freight

hauled from Duluth-Superior to the Twin Cities so as to give dat as to what part of the total freight was represented by soft coal hard coal, and iron. The responses show that, of the 1,954,458 tons

	Per cent.
Soft coal represented	72. 3
Hard coal represented	27. 6
Iron and steel represented	. 1

40. The added 22 per cent for local population along the cana increases the estimate of shipments southward of bulk goods fro 1,954,568 to 2,384,573 tons. Applying the above percentages w find approximately:

	Tons.
Soft coal	1, 724, 000
Hard coal	658, 200
Iron and steel	2, 400

41. The 22 per cent increase can not materially affect the flou figures, but the total will be 251,400 tons (allowing a soldier's ratio of 18 ounces per day to every individual in the eight counties). Th makes the grand total of bulk freight 2,636,000 tons. Railroa people estimate that this represents 80 per cent of the entire freigh shipment. It is not unreasonable to assume that the other 20 pe cent or 659,000 tons, is divided equally between grain and gener merchandise. As nearly as we can estimate the actual figures, th total freight for the fiscal year 1912 moved between Duluth-Superio and the Twin Cities and moved into and out of the eight counti along the canal would be:

	Per cent of all.
Soft coal, 1,724,000 tons	52. 3
Hard coal, 658,200 tons	20. 0
Iron and steel, 2,400 tons	. 1
Flour, 251,400 tons	7. 6
Grain, 329,500 tons	10. 0
General merchandise, 329,500 tons	10. 0
Total (3,295,000 tons)	100. 0

42. How much of this would this canal probably carry? T Erie Canal in 1880 carried 4,608,581 tons, or 18 per cent of the tot freight moved by rail and canal between Buffalo and New York. 1906, the last year for which statistics are available, we find that t canal carried 2,385,491 tons, an actual decrease in freight handled nearly 50 per cent, and of the total freight carried between Buffa and New York the canal carried only 3 per cent. It had then lo one-half of its actual traffic and had dropped from 18 to 3 per cent its proportion of the total freight carried between Buffalo and Ne York.

43. *Freight shipment by Mississippi River system.*

	Tons carried.		Loss.
	1889	1906	
			Per cent.
pper Mississippi	3,947,364	595,885	85
linois River	180,264	105,826	41
issouri and tributaries above St. Louis	2,132,820	1,056,390	50
Total upper river	6,360,448	1,758,101	72
hio River	15,796,968	15,226,805	4
ower Mississippi	6,232,087	2,546,187	59
Total Mississippi River	28,289,503	19,531,093	31

44. The Erie Canal is the best waterway for comparison with the roposed canal. Both are in a region where navigation is closed r several months by climatic conditions, and both are dependent pon and become a part of the traffic of the Great Lakes. Both are aralleled by many efficient and competing railroads, some interstate d some intrastate.

COST OF TRANSPORTATION BY CANAL.

45. This subject will be taken up under two headings: (*a*) Cost to e United States, and (*b*) cost to water carriers. For the purpose discussion several cases will be assumed (1) that the canal operating r seven months of the year will carry all the present freight, or 295,000 tons; (2) that the canal will carry 50 per cent of the entire eight, or, 1,647,500 tons; (3) that the canal will carry 18 per cent the entire freight as the Erie Canal did in 1880, or 593,100 tons;) that the canal will carry 3 per cent of the entire freight as the ie Canal did in 1906, or 98,850 tons; (5) that the canal will carry l freight except coal; (6) that the canal will carry all freight except ft coal; (7) that the canal will carry all grain and flour northward d all hard coal southward.

(*a*) *Cost to the United States.*—The canal to be commercially justi- d must save to the public at least $420,000 per annum, an amount uivalent to a reduction of the selling price of the freight handled der the various conditions, as follows:

	Per ton.
(1) 3,295,000 tons	$0.13
(2) 1,647,500 tons	.25
(3) 593,100 tons	.71
(4) 98,000 tons	4.25
(5) 912,800 tons	.46
(6) 1,571,000 tons	.27
(7) 1,239,100 tons	.34

(*b*) *Cost to water carrier.*—In discussing this feature it is necessary note a circumstance which works greatly against the canal. Du- h-Superior Harbor does an immense business in both receipts and pments. For the calendar year 1911, the total receipts were 24,962 tons, of which 8,434,905 tons (or practically 90 per cent), s coal. All of Duluth-Superior's receipts by lake, except a few nor items, are such that their proper quota would be sent to St. ul and Minneapolis. The lake shipments from Duluth-Superior 1911 were 21,247,884 tons of which 19,014,620 tons (90 per cent)

were iron ore, practically none of which could use the canal; 809,00
tons were wheat, of which it will be shown later, a small amou
passes through the Twin Cities and practically none would use th
canal; 232,000 tons of oats, barley and corn, of which a portion migh
use the canal; 431,200 tons of flour, of which one-half (see figures
State railroad and warehouse commission) originates in Minneapol
and might use the canal.

Of all the lake shipments from Duluth-Superior (see Annual Repo
of the Chief of Engineers for 1912, p. 2461) there is little that can
claimed for the canal except probably one-half of the 431,200 tons
flour and a portion of the 232,000 tons of oats, barley, and cor
Probably nine-tenths of the general merchandise carried between th
two termini moves southward. In the figures given by the Stillwat
people in 1909 (H. Doc. No. 304, 61st Cong., 2d sess.), they menti
120,000 tons of general merchandise southbound and do not eve
mention it in the northbound statistics, but there may be a sma
amount in the 57,000 miscellaneous northbound. Thus it appea
that 500,000 tons would be a large figure for available freight
Duluth-Superior, while the available return freight would be mo
than 2,000,000 tons. It must therefore be concluded that of eve
four barges taking freight to the Twin Cities at least three must retu
to Duluth empty. The latest available figures showing avera
freight rates on the Erie Canal was 3 mills per ton-mile, as given
the Interstate Commerce Commission. (Railways in the U. S.
1902, pt. 2, A 40-Year Review of Changes in Freight Tariffs, Was
ington, D. C., 1903.)

46. The entire distance from the Duluth-Superior Harbor to Mi
neapolis is about 260 miles, giving 78 cents as a payment to the wat
carrier on the same basis as the Erie Canal rates. It might
claimed, and justly, that the single-barge method, or that of one bar
towing another, is unduly expensive between Taylors Falls and
Paul. A fleet made up and towed by a single steamer is the ec
nomical method on an open waterway, but it would undoubtedly
more expensive to make the change. The delay to the steamer
waiting for and making up a tow could not be avoided unless t
barges had to do the waiting, and if either waits, there is a lo
While the steamer is towing the fleet to and from Minneapolis, t
barge crews would be idle. The only expense of the single bar
over the fleet would be a little loss of economy in fuel and a lit
longer time in making the run. These would not cover the cost
the towboat with its necessarily lost time. The single barges, or o
towing another, would undoubtedly complete the trip at both en
of the waterway without assistance, and the Erie Canal rate shou
apply for the entire 260 miles, amounting to $0.78 per ton.

47. But it is improbable that the Erie Canal boat has to go ba
empty three trips out of four. The commodities to be shipped
that section are not so unbalanced in the two directions as they
between the Twin Cities and Duluth-Superior. In the case of t
Erie Canal general merchandise is going in either direction; machine
and structural iron may be going in either direction, and the chan
of a return cargo are much better than 1 in 4. It would theref
appear that with the one-way traffic between the Head of the Lak
and the Twin Cities, the Erie Canal rate would be none too large a
very probably too small.

48. If the two costs now be added there will result:

Case.	Canal carrying.	Cost to United States.	Cost to shipper.	Total.
	Per cent.			
	100	$0.13	$0.78	$0.91
	50	.25	.78	1.03
	18	.71	.78	1.49
	3	4.25	.78	5.03
all but coal		.46	.78	1.24
all but soft coal		.27	.78	1.05
coal, grain, and flour		.34	.78	1.12

49. Railroad rates between St. Paul and Duluth, January, 1913, er ton of 2,000 pounds:

	Rate.		Rate.
al, hard	$1.25	Iron (bar or band)	$1.50
al, soft	.90	Iron, pig	1.12
eat	1.00	Lime	1.20
ur[1]	1.00	Rails	.90
rse grain	1.00	Salt	1.00
mber	1.20	Sand	1.00
uctural iron	1.50	Stone	1.00
ilding stone	1.00	Stone, crushed	.80
n castings	2.00	Sugar	1.60
nent	1.00		

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[1] One road charges $1.50.

50. These are the rates between the two cities, but not the rate id by the St. Paul and Minneapolis merchant on general merandise which he receives through Duluth and Superior from the st. The "package freighters" on the Great Lakes are generally lroad-owned boats and the Twin City merchants get a "lake-andl" rate from the east to the Twin Cities, which gives them the vantage of a very low rate from the Head of the Lakes. This tter is now before the Interstate Commerce Commission on comint of the business organizations of Duluth-Superior that it ows the Twin City merchant to receive merchandise and ship it ck over the same lines to smaller towns more cheaply than the luth-Superior merchant can reach the same towns. This conion has existed many years and may or may not persist, but we l continue the discussion on the basis that the Twin City merchant y have to pay the rates above stated.

51. Having determined the average rate on the canal, it remains determine the average railroad rates on all commodities. The erage rail rate for iron may be taken as the average rate on the five ds, or $1.40. The general merchandise rate may be taken as the erage on stone, cement, lime, salt, and sugar, or $1.16. The erage rate on all freight may thus be determined:

Soft coal, 1,724,000 tons, at 90 cents	$1,551,600
Hard coal, 658,200 tons, at $1.25	822,750
Iron and steel, 2,400 tons, at $1.40	33,600
Flour, 251,400 tons, at $1	251,400
Grain, 329,500 tons, at $1	329,500
General merchandise, 329,500 tons, at $1.16	382,220
Total (3,295,000 tons)	3,371,070

$$\frac{3{,}371{,}070}{3{,}295{,}000}=\$1.024 \text{ the average rail rate on all commodities.}$$

If the canal rate of 78 cents be subtracted from this rail rate it giv 24.4 cents as the difference which may go to reimburse the Unit States for its expenditures. This practically corresponds to case (above, which means that the canal must haul 50 per cent of all freig in order to equal railroad rates and make good the Government outlay.

COMPARISON.

52. The canal, in order to transport as cheaply as the railroa must handle annually 1,647,500 tons, or 50 per cent of the traffic f the fiscal year 1912. It may be claimed that the total freight w increase from year to year and a reduced percentage will keep up t actual tonnage. This is undoubtedly true if the canal can obta and keep up 1,647,500 tons per annum. It has already been point out that between 1880 and 1906 the actual tonnage carried by t Erie Canal reduced one-half and its proportional tonnage reduc from 18 to 3 per cent. Thus, while the total tonnage betwe Buffalo and New York was increased 200 per cent, the actual to nage carried by the canal was reduced 50 per cent. History d not favor the claim made by its advocates that the canal may n be commercially feasible now, but that when commerce develops will be a necessity. If it can not compete now, there is little ho for the future.

53. In order to compete with the railroads the canal must eith reduce the rates, give better service, or both. A reduction of cents per ton in freight rate will not, with our present business me ods, offset much in adequacy of service. It will scarcely be claim that the canal can give better service than the railroads and it m therefore give better rates. It has been shown that it must han 50 per cent of the present commerce in order to equal the rail rat It must, in order to reduce the rates an average of 12 cents per t (average rail rate $1.024 minus case 1, $0.91), carry the present ent tonnage; must carry it all in an open season of seven months, a must give a service equal to that of the railroads.

54. The various commodities will be taken up to show why canal will or will not carry them. In these discussions figures a estimates are taken indiscriminately from previous reports and fr the remarks of Mr. Barnes made at the public hearing (Appendix and the papers of Messrs. Little (Appendix C), and Hall (Appen D), and Citizens' Canal Association of Stillwater, Minn. (Appen E). It will be impossible to note the references in all cases.

COAL.

55. Of all the traffic between the Head of the Lakes and the T Cities, 72 per cent is coal. Of this, 72 per cent is soft coal and per cent hard coal. Duluth and Superior are the coal yards of Northwest and particularly of St. Paul and Minneapolis. They at the head of a system of deep-water navigation which reaches near the eastern coal fields that the railroad haul from those fie to Lake Erie is short. They have a large harbor, with little fluct tion in water level, with flat shores, and with shallow water near shores, affording excellent opportunities for large coal docks, wh coal is handled by the most modern machinery from the large l

vessel to the docks on which it is stored ready for shipment to the consumer. When called for it is screened, loaded on cars in the same economical manner, and shipped out. Contrast these conditions with those to be found at St. Paul and Minneapolis. The Mississippi River between and including the two cities is in a gorge, giving no room for large coal yards in the bottom lands, and with few points where railroads can handle a large coal business between the river and the cities. The city of St. Paul is now contemplating changing the course of the Mississippi River so as to make room for a union tation for passenger service. The fluctuation of the river at St. Paul is about 20 feet, and at Minneapolis it will be about 8 feet after he dam is completed. The conditions are not unlike those at Cininnati, except that the fluctuation of the river at that place is nearly 0 feet. On a fluctuation even as small as that in Minneapolis or t. Paul, the same kind of machinery for unloading coal will be eeded; the same amount of labor will be necessary; the same diffiulties in clam-shelling the coal in the barge will be encountered; nd the cost can not be much less. Regarding the cost of unloading arges at Cincinnati the superintendent of the chamber of commerce rote:

CINCINNATI, *June 26, 1909.*

DEAR SIR: In reply to yours of June 23, we have pleasure in inclosing tables showg the receipts here of coal for a series of years, indicating quantities by river and y rail and sources of supply.

The rail freight rate on coal from Kanawha region to Cincinnati is $1 per ton. This lates to coal destined for delivery in this market; shipments made to points beyond is market have a joint rate understood to be on a lower basis.

By river the freight rate is 50 to 62½ cents per ton; additional to this is the cost of evating from barges to elevators to get the coal in position for delivery on track r shipment or to be otherwise distributed. This represents 25 to 35 cents per ton, that the river freight plus elevating is practically the same as the rail rate.

Yours, truly,

C. B. MURRAY, *Superintendent.*

56. The tables referred to in the letter show that in 1896 the river ceipts were about 59,000 tons and the rail receipts were about 21,000 ns (26 per cent), while in 1908 the river receipts were about 36,000 ns and the rail receipts were about 85,000 tons (70 per cent on 50 r cent greater total receipts). The actual amount delivered by ver in 1908 was only 60 per cent of that in 1896. This shows that must allow a cost of at least 25 cents for every ton of coal delivered om the river at Minneapolis and St. Paul and further indicates that e railroads are running the Ohio River, the greatest coal river in the rld, out of the coal business, on a haul of 200 to 300 miles, although e actual difference in freight rate in favor of the water haul is ½ to 50 cents. With regard to the item of 25 cents for unloading al at the river bank, it may be stated that the unloading at Cinnati is done from barges entirely open. If such barges be used coal on the proposed canal they would be entirely unfit for carry- of any possible return freight. If the barges be decked, as they ist be for handling grain or flour, the unloading of coal would be re expensive.

7. For the sake of comparison we may assume that the coal can put into barges at the vessel's side in Duluth Harbor as cheaply it can be put on the wharf at Duluth-Superior. This is very btful when we compare the modern machinery used at the large

coal docks, with a floating conveyor, and when we consider th
advantage of dumping in large piles over stowing in barges. Th
coal is then on its way to St. Paul, via the canal, at the same cost tha
it would have represented on the dock at Duluth. It must pay th
canal freight rate and a cost of 25 cents per ton to unload it on th
river bank in St. Paul. This unloading operation gives it an extr
handling, with a clamshell bucket. It is now in the same conditio
with respect to delivery to the consumer that it is on the dock
Duluth, ready to be screened and delivered. The large coal deale
place a minimum deterioration of 25 cents per ton as the result
breakage in each handling of coal such as is necessary in unloadin
from the barges at the river bank. The coal is now on the riv
bank, and has cost the wholesale dealer the same that it would c
the wharf at Duluth, plus the canal freight rate, plus 25 cents f
unloading and elevating, and plus 25 cents for deterioration
unloading. This 25 cents for breakage is probably the explanati
of the fact that Cincinnati prefers to get its coal by rail rather tha
by river.

58. The coal has to be screened and delivered to the carload co
sumer and to the local coal yard, just as at present it has to be, fro
the coal dock at Duluth or Superior. In those cities the charge a
cost of carload deliveries to large consumers and to retail yards is
cents per ton, and there is no reason to believe that it would cost le
in St. Paul.

59. The cost of coal to the wholesale consumer or retail dealer
the Twin Cities must be either:

(*a*) *By rail.*—The cost of the coal on the Lake vessel in Dulut
Superior, plus the cost of unloading, screening, and loading, plus t
railroad rate (90 cents for soft and $1.25 for hard), and plus t
dealer's profit, or

(*b*) *By canal.*—Every item the same except that for railroad ra
there must be substituted canal rate plus 75 cents for unloadin
breakage, and delivery.

60. It therefore appears that the dealer can afford to pay a ca
rate of 15 cents per ton on soft coal and 50 cents per ton on hard co
This actual rate on the Erie Canal basis should be 78 cents. In th
figures there is no return to the United States on its investment.

61. This discussion presumes that the wholesale dealer in the Tw
Cities can practically supply everybody largely in the open season
navigation. To keep any large stock during the closed season
would require more storage room than can be had on the river, a
in that case another storage yard will be necessary, requiring an
ditional handling and hauling to that yard and the rent of such
yard, for all of which the consumer must pay. It may be argu
that the cost to the consumer would be reduced by avoiding this
ditional yard and that he will stock up for the winter. Such
argument is futile. Even though the consumer may know the c
ditions, he, either from necessity or from a preference for seeing
coal merchant's money, rather than his own, tied up in his need
supply, will order his coal as he wants it throughout the winter seas
As that is the season of greatest consumption in all lines, there is lit
doubt that one-half the coal consumed in St. Paul and Minneap
will require the extra handling and hauling and the extra stor
yard away from the landing place on the river bank.

62. If cost does not favor the canal, and it does not, we must look o service. Any consumer or dealer in St. Paul or Minneapolis can rder from a coal company a carload of coal one morning and gen- rally he will have it at his door or yard the next morning, and cer- ainly the second morning with delivery made from Duluth or uperior. He could not get it much more quickly if delivery were ade from stock in his own city.

63. Duluth-Superior is the natural and economical coal yard for t. Paul and Minneapolis.

64. Much of the coal coming into St. Paul and Minneapolis is for ilroad use and would naturally be hauled by the roads themselves.

65. The coal used for Government purposes in the Twin Cities will ot move by the canal, as there is a land-grant rate of 50 per cent on overnment freight.

66. It can be safely stated that the consumer or retail dealer is not ing to buy coal from the Minneapolis or St. Paul wholesale dealer rough sentiment, rather than from the agent of the Duluth or Supe- or dealer, when he can get the same coal with good service from the tter at a considerably lower figure.

67. The canal will not, if built, move coal from the head of the kes to the Twin Cities. Coal is 72.3 per cent of the traffic between luth-Superior and St. Paul-Minneapolis, leaving 27.7 per cent, or 2,800 tons for the canal. With this amount of freight the cost of nsportation to the United States becomes:

$$\frac{420,000}{912,800}=46 \text{ cents.}$$

8. This, added to 78 cents for freight by the canal, gives $1.24 as e cost of transportation. The average railroad rate on the same mmodities is $1.09. Therefore the canal can not carry the coal and n not exist on all other freight combined.

9. Various statements have been made as to the percentage of the l received at Duluth-Superior which goes to St. Paul, Minneapolis, d the Minnesota Transfer. In the fiscal year 1912 the railroad fig- es show the latter to be:

	Tons.
Soft coal	1,724,000
Hard coal	658,200
Total	2,382,200

n the same fiscal year the receipts at Duluth-Superior were:

	Per cent to the Twin Cities.
Soft coal, 7,115,831 tons	24
Hard coal, 1,255,330 tons	52
Total, 8,371,161 tons	28

ince little of the 1912 receipts would move to the Twin Cities ore June 30, it would probably be better to take the receipts at uth-Superior for the calendar year 1911 and compare them with Twin Cities receipts for the fiscal year 1912:

Per cent to the Twin Cities.

Soft coal, 7,070,337 tons	24
Hard coal, 1,364,568 tons	48
Total, 8,434,905 tons	28

Based on the figures given, it may be stated that of all the co received at Duluth-Superior about 28 per cent goes to St. Paul, Mi neapolis, and the Minnesota Transfer; that of the soft coal about or quarter goes to those places; and that of the hard coal about one-h reaches those points.

WHEAT.

70. The great wheat-growing section of the United States lies nor of an east and west line through St. Paul. Three railroad syste are available for shipping this crop direct to Duluth-Superior witho passing through the Twin Cities, and only a very small part of th going to the head of the Lakes is hauled by the roads between Min apolis and Duluth. The statistics submitted by the Stillwater ci zens show that in 1908 there were hauled from the Twin Cities to t head of the Lakes 2,562 cars of wheat, or about 2,135,000 bushe The wheat shipped by lake from Duluth-Superior the same year w 53,057,105 bushels—the railroads between the Twin Cities and Dulu hauled into Duluth-Superior 4 per cent of the wheat carried do the Lakes from that harbor.

71. The rate on wheat from the Twin Cities to the Head of Lakes is $1 per ton, or 3 cents per bushel. Wheat coming throu from certain favored points goes to the Head of the Lakes at a chea rate. The actual added amount for completion of the trip to Dulu is sometimes as low as 1 cent per bushel. A large shipper of wh in Minneapolis states, however, that 90 per cent of the wheat pa 3 cents per bushel, or $1 per ton. Wheat coming into Minneap from the favored points may be stopped, offered for sale, and th sent on to Duluth without increase in rate. The wheat (90 per c of the whole) which must pay $1 comes into Minneapolis on cars its way to Duluth. In order to transfer to barges it must pay an vator charge of three-fourths cent per bushel, or 25 cents per t it would probably have to assume a different rate of insurance water, leading to trouble and complications, and, although grain m claim that it takes as long as five days for rail shipments to re Duluth from the Twin Cities, there is no doubt that they will aver considerably shorter in time than those by canal. A case is rela by a Duluth vessel agent where he, even in the congested seaso 1912, learned on Saturday of an available vessel which would h her coal unloaded on Monday and could not get an ore cargo.

A Minneapolis dealer had a cargo of wheat in Minneapolis wh he wanted shipped. The wheat was delivered in Duluth and on way down the Lakes by Tuesday noon. This could not have b done by canal. It may be argued that it would have moved ear by canal. It would not have then been available for sale in Min apolis, as it was, up to the time the vessel was chartered. Again it gone on to Duluth by canal it might have been held there m days in barges—not a cheap storage—without obtaining a vesse carry it.

72. The elevator charges (25 cents per ton) having been paid in
inneapolis, the wheat will be on the barges with 75 cents to pay
canal rate of 78 cents—on the Erie Canal basis, neglecting the
overnment's investment. The wheat may be in an elevator in
inneapolis, and then it has to pay no more elevator charges than
would by rail and the full $1 will be available for expense by
anal. There are no figures to show what portion of the wheat
oing to Duluth-Superior now passes through the elevators (actu-
lly unloaded and loaded again) in Minneapolis on its way. It is
ot believed that it is large. It is seen above that 46 cents per
n should be charged against the freight to reimburse the public,
en if the canal hauls everything but coal, making $1.24 (78 and
6 cents) the full cost by canal under those circumstances. So
ere is no hope that the canal will haul the wheat, even in the most
vorable case, except at a loss to the United States on its investment.

73. A Minneapolis wheat dealer states that the canal would be
great boon to the business. For what, since it can not compete
ith the rate by rail? To relieve the terrible congestion in Minne-
olis. That would make the canal useful three months in some
ars and not at all in others. In support of his claim he submitted
ures which showed the shipments by the roads—Northern Pacific,
eat Northern, and Omaha—for the months of September, October,
d November, 1912. An analysis of those figures showed some
ry startling traffic for the Omaha road. Upon investigation he
rned that the figures from the books of that road included every-
ing going out of Minneapolis—not to Duluth-Superior only. By
owing that the Omaha and Soo lines together carried as much
the average of the Great Northern and Northern Pacific the
ipments shown in the table below result. It is not believed that
ese two roads shipped together as much as the average of the
er two, for the Great Northern and Northern Pacific hauled in
fiscal year 1912 92 per cent of the return heavy freight, as shown
the figures of the railroad and warehouse commission. On the
umed basis, however, the figures are:

	Tons.
Wheat, 2,784,030 bushels	83,521
Corn, 404,760 bushels	11,333
Oats, 382,560 bushels	5,738
Barley, 913,725 bushels	21,879
Rye, 31,440 bushels	880
Flax, 140,055 bushels	3,922
Flour, 2,009,580 bushels	200,958
Mill stuffs	82,521
Linseed oil, 2,579,633 bushels	1,290
Oil cake, 31,733,504 bushels	15,867
Hay	1,610
Total	429,519

4. It will be seen that these figures are larger than those given
the citizens of Stillwater in their statistics for 1908, being on wheat
per cent more (for the three heavy months only) than the entire
ment for 1908. The wheat crop for 1912 was very large. It is
erstood that every elevator in Duluth-Superior and in Minne-
lis was full at the end of the lake navigation season, that thou-
ls of loaded cars lay in Minneapolis, that all available ships on

the Lakes were loaded with wheat, that the harbor at Buffalo w full of loaded ships, and that the insurance season on the Lakes w extended 15 days in order to relieve the grain congestion. Und these conditions it is not seen how the congestion could have be relieved by the canal except to use the barges as storage, which wou have amounted to little. Even with this heavy freight movem and if it had all gone by the canal (i. e., represented the canal freig for the year), the tax alone to reimburse the United States for investment, maintenance, and operation would have been:

$$\frac{420,000}{429,519}=98 \text{ cents,}$$

almost the cost of complete shipment by rail, as the average rail r on all this list is practically $1. If less than the full amount giv had been shipped by canal during the entire season, the amount nec sary to reimburse the public would have been more than the rail ra Without a return cargo, and without coal there can be none, the ca rate must be greater than 78 cents.

CANAL CAN NOT COMPETE WITH RAILWAY.

75. The canal can not compete with the railroad rate; it can give better service; it can not relieve the congestion in large c seasons; and it can not be brought into use in connection with Minneapolis elevators, without a great deal of work on them most cases, and rebuilding in some cases. There appears to be consideration whereby the canal can recommend itself as a tra porter of wheat or coarse grain from Minneapolis to the Head of Lakes.

COARSE GRAIN.

76. In this are included rye, oats, barley, and corn. Most of s grain comes from a section farther south than the wheat-produc country, although some of them are raised in the same section. statistics of the Stillwater citizens show that the railroads in 1 shipped four and one-half million bushels of these grains from M neapolis and St. Paul to Duluth-Superior. The Duluth-Supe statistics show there were shipped down the Lakes the same y 13,000,000 bushels. Duluth-Superior therefore got their local c sumption and eight and one-half million bushels from other locali than through St. Paul and Minneapolis. The four and one- million bushels means about 93,000 tons which moved to the H of the Lakes from St. Paul and Minneapolis. That portion of th grains raised in the general wheat section must almost necessa find its outlet via the Great Lakes, as they would reach their nat market most cheaply that way. It is evident that 93,000 tons fr Minneapolis and St. Paul found an outlet that way in 1908. would any great amount be diverted to Duluth-Superior from country south of St. Paul if the canal existed? The destinatio these grains is St. Louis, Milwaukee, and the Middle and South States, where large quantities are used in distilleries and brewerie fed to stock in sections too far south to raise them economica Their great market is Chicago.

From St. Paul the Mississippi River runs southeast 143 miles to
a Crosse, then turns south. From that point to Chicago is 270
iles by rail, and the rate on all grains is $2.50 per ton. Suppose
ain comes to the Mississippi River by rail at La Crosse. It has the
ioice of taking the canal and reaching Chicago via Duluth-Superior,
of continuing on to Chicago by rail at $2.50 per ton—probably
duced somewhat on through rate from point of origin to Chicago.
levator charge at La Crosse (1 cent per bushel, average weight per
ishel 45 pounds) will be 44.4 cents per ton; freight from La Crosse
Duluth (at canal rate of 3 mills per ton-mile, 326 miles) 98 cents
r ton; elevator charges in Duluth 44.4 cents; and 2½ cents per
ishel water transportation to Chicago, $1.11 per ton. This gives a
tal of $2.98 or an actual loss of 48 cents. The average value of a
n is about $210. It will require 9 to 10 days to make the trip via
uluth without any delays, and there are many chances for delays.
om La Crosse to Chicago by rail should be made in 3 days. The
iterest at 5 per cent on $210 for 6 days is 17 cents and would be an
ditional loss to the 48 cents or a total loss of 65 cents per ton.
iere is nothing in the canal to attract coarse grains from La Crosse,
d La Crosse is considerably north of the Iowa-Minnesota line.
ius the canal can not draw coarse grain from Iowa, Missouri, and
braska; coarse grain is discussed under "wheat" in a way to show
iat the canal can not carry that from Minneapolis and St. Paul at a
ofit on the railroad rates; and it can therefore ship only the small
nount that might reach the Mississippi River south of St. Paul
ad north of La Crosse—the southern limit of canal competition with
l to Chicago. This might mean 100,000 tons. In 1908 the Twin
ies sent 93,000 tons to the Head of the Lakes, and in September,
tober, and November, 1912, they sent 88,000 tons. It will there-
e be conceded that the canal might carry 100,000 tons of coarse
in from the country between St. Paul and La Crosse.

GENERAL MERCHANDISE.

7. This class of merchandise is ill adapted to transportation by
rges. Little or none of that received in the Twin Cities via Duluth-
perior originates in the latter cities. It practically all comes from
East under the lake-and-rail rate already mentioned, which costs
Twin Cities merchant only 40 cents per ton over the cost to the
luth merchant. As long as this arrangement exists there is no
ance for this class of freight to be handled by the canal. This
ight is handled on the lakes by railroad-owned steamers; the rail-
ds allow free storage and handling in Duluth and Superior. It is
adapted to barge transportation, and the railroads are not going
handle it from its origin to Duluth-Superior and then turn it over
ndependent barge owners for delivery in St. Paul—not if they have
haul it at a loss. (See Appendix C, by Mr. Little.)

8. No reason whatever can be seen for putting general merchan-
e in the list of probable freight for the canal.

IRON AND STEEL.

9. These goods come under the same lake-and-rail rate as applies
general merchandise, and the same statements and conclusions will

apply. It therefore appears that this material has practically n chance of going by the canal.

80. There is nothing left for the canal but an admitted 100,000 ton of coarse grains to Duluth-Superior and a possible shipment 250,000 tons of flour in the same direction. What appeared a 4 to one-way traffic from Duluth-Superior now becomes a complete one way traffic to Duluth-Superior. With only 350,000 tons availabl the cost to the United States will be—

$$\frac{420,000}{350,000}=\$1.20$$

FLOUR.

81. The rate on flour from Minneapolis to Duluth is $1 per ton o all roads except one and that charges $1.50 per ton. But the railroad allow free storage and handling at Duluth-Superior for flour haule by them from Minneapolis. They haul it heavily during the slac or winter season and when the navigation season opens on the Lake there is a large stock on hand at the Head of the Lakes ready f shipment. The independent barge owner would have no storag unless he built or rented it, except his barges. The vessels carryi flour on the Great Lakes are railroad owned; the railroads nee flour as freight particularly in winter; they are convenient to t mills at Minneapolis and the docks at Duluth; and who can be filled with optimism as to believe that flour would be transported canal to Duluth and there received on equal tems by railroad-own vessels even if the canal rate could compete with the railroad rat One dollar per ton is the regular rail rate (although one road charg $1.50) and the canal rate has to be counted as 78 cents, leaving cents per ton for transferring to the steamer at Duluth. This allo nothing to reimburse the United States for its expenditure, which h been shown to require 13 cents per ton if the canal hauls everythi between termini and along its route, and 46 cents per ton if it hau everything but coal. On wheat, which is more easily handled th flour, the elevator charge in Duluth-Superior is 1 cent per bush or 33 cents per ton, and the railroad-owned steamer in Duluth is n going to make it easy for the independent barge owner who h hauled the freight naturally belonging to the railroads. Much flo now goes to the shores of Lake Michigan for shipment east, bei hauled over roads in which it is stated the mills are interested. is believed that it would require a great reduction in freight rate make the flour mills desert the railroads and the canal can not bri about this reduction. The flour mills can not be blamed for desiri to favor the railroads as they would be absolutely dependent up the five months in the year if the canal were built.

82. Flour will not go by the canal.

LOCAL FREIGHT.

83. It is therefore manifest that there is nothing left for the can but the local freight—18 per cent of the entire freight. It will seen by looking back to case 4 that with 18 per cent of the tot freight, the Government's expenditure would amount to 70 cents p

n. Local freight would be largely general merchandise, and we
ave seen that the lake-and-rail rate allows the St. Paul merchant to
ip well back toward Duluth cheaper than the Duluth merchant
n reach the same point. All the towns on the St. Croix River are
elow Taylors Falls, and the St. Paul merchant under present freight
nditions can more than compete with the canal on general merchan-
se and steel—he can entirely defeat it. The production and con-
mption of the whole canal region north of the Grantsburg crossing
the Northern Pacific Railroad (and this is in the favored terri-
ry) are little or nothing to support a canal.

DEVELOPMENT.

84. The claim is made that the canal will develop a large com-
erce, and such articles as building stone, clay products, sand,
ment, and lime are mentioned. This is all based on the absolutely
istaken idea that the freight rates through the canal are going to
40, 50, or 60 cents per ton less than railroad rates, and that these
ry cheap rates will start a great trade in such things as must, in
der to move at all, have very low rates. These false figures are
sed on what is read of the freight rates on such a waterway as the
eat Lakes, where large volumes in one cargo are carried in the
eapest manner possible, and where rates are often much lower than
ey would be but for the fact that vessels can afford to move freight
eaply in order to get return cargoes, and thus be at least making
penses both ways. It is not appreciated by those advocates of
nals that there is a vast difference between moving many thousand
ns in one cargo over a wide, deep, direct, and level waterway and
king the same commodities in small barges through a narrow,
duly long, and shallow waterway over intervening hills to a height
more than 400 feet. There can be no cheap rate over such a water-
y, and in the present instance there is not enough difference between
e actual cost of transporting any commodity over the proposed
nal and the present railroad rate to pay for the extra handling,
eakage, inadequacy of service, loss of time, and probably increased
surance in the case of articles liable to damage from water. The
ole argument is based on a fictitious low rate to result from the
nal, and they all assume that a low rate must follow its construc-
n—they have heard it stated and do not question it. It can not
low, will not follow, and should not be expected to follow.

EFFECT ON RAILROAD RATES.

5. If the canal can not compete with the present railroad rates, a
luction of railroad rates to meet canal rates is impossible.

DIVERSION OF TRAFFIC.

6. It has been claimed that the canal will attract a large commerce
now existing; that it will actually stop the shipment of coal
m the Illinois fields to St. Paul and Minneapolis by rail, all coal
these cities coming via Duluth-Superior from eastern fields; and
t much grain from the country south of St. Paul, which now goes
ect to Chicago, will go via Duluth-Superior through the canal.

The whole foundation of these arguments is that same fictitious lo rate through the canal.

STEEL PLANT.

87. Great stress is laid on the large steel plant now building in Dulut by the United States Steel Corporation. Its products may go eas and compete in the eastern market. It has chosen to bring the coa to its iron ore, rather than take its iron ore to the coal. This is wise move to balance shipments. The large bulk-freight carriers o the Great Lakes have iron ore and grain to take down the lakes an nothing but coal to bring back. The shipments of ore and grai from Duluth-Superior Harbor in 1911 amounted to more tha 20,000,000 tons. The coal brought back was about 8,400,000 tons three vessels of every five came back empty. The establishment a large steel plant at Duluth does away with the necessity of shi ping its consumption of ore and calls for a corresponding increase i the receipts of coal. It tends to balance trade, and thus reduces th number of lake vessels necessary to do the same amount of business It should result in more economical production of the finished articl and may enable the corporation to ship its steel down the lakes t the greater market, using an entirely different class of vessel—th class that brings back general merchandise—from the bulk-freighte The Duluth Steel Plant may, and probably will, ship its product wes into the undeveloped country toward the Rocky Mountains. Bu will it ship south? Not far. As soon as it reaches La Crosse it wi be in the natural territory of its own plant at Gary, and it is no establishing two plants to compete in the same territory. The Gar plant now has shallow-water connection with the Mississippi River a Rock Island and St. Louis, and in the probably not distant futu will have a deeper canal.

88. The large volume of the Duluth Steel Plant's product will no go south. Its raw material will come from the mines and the low lakes, and it can have no great interest in this proposed shallow-wat canal.

GENERAL SUMMATION.

89. The Erie Canal rate would require a payment to the wat carrier of 78 cents. The Government's expenditure on the can would tax the freight to various extents from 13 cents to $4.2 corresponding to the proportion carried by the canal (from 100 pe cent down to 3 per cent) of all freight between St. Paul-Minneapol and Duluth-Superior and all the freight of eight counties which th canal will pass through or touch. If we neglect, for the time bein the Government's expenditure, the different commodities will appe as follows:

(*a*) *Soft coal.*—Canal rate, 78 cents; unloading at St. Paul Minneapolis, 25 cents; breakage in unloading, 25 cents; 50 per ce transferred to another yard, at least 10 cents; making same deliver that railroad makes, 25 cents; total, $1.63. Rail rate on soft coa 90 cents; loss, 75 cents per ton.

(*b*) *Hard coal.*—Canal rate, 78 cents; unloading at St. Paul, 2 cents; delivery in St. Paul, 25 cents; total $1.28. It will be note that the anthracite coal is charged nothing for breakage or ext andling to another large yard. Rail rate on hard coal, $1.25. Loss, cents per ton.

(c) *Iron and steel.*—Canal rate, 78 cents; unloading in St. Paul ame as coal which is more easily handled), 25 cents; delivery (same for coal), 25 cents; total, $1.28. (Storage in Duluth-Superior lost.) isted rail rate, $1.40. (Actual much less.) Gain, 12 cents per ton.

(d) *General merchandise.*—Exactly the same throughout as iron d steel, $1.28. (Storage in Duluth-Superior lost.) Listed rail te, $1.16. (Actual much less.) Loss, 12 cents per ton.

(e) *Grain.*—Canal rate, 78 cents; elevator charges in Twin Cities, cents per ton (three-fourths cent per bushel, average weight of ain shipped Duluth-Superior, 55.6 pounds per bushel, or 36 bushels the ton); elevator charges in Duluth-Superior (1 cent per bushel), cents; total, $1.41 per ton. Railroad rate on grain, $1 for 90 r cent and 50 cents for 10 per cent, or an average of 95 cents. ssume that one-half the wheat passing through Minneapolis would y elevator charges even if sent forward by rail, 13.5 cents; eletor charges in Duluth-Superior, 36 cents; total, $1.445. Gain, cents per ton.

(f) *Flour.*—Canal rate, 78 cents; loading in Minneapolis, same as cars; transferring in Duluth-Superior (same as wheat), 33 cents; tal, $1.11. (Loss of free storage and advantage of stocking up Duluth-Superior during winter for spring opening.) Railroad te, $1. Loss, 11 cents per ton.

90. By adding the amount neccessary to reimburse the United ates—shown in each case under the heading—there will result:

Table showing loss per ton.

Article.	Case 1, 13 cents.	Case 2, 25 cents.	Case 3, 71 cents.	Case 4, $4.25.	Case 5, 46 cents.	Case 6, 27 cents.	Case 7, 34 cents.
(soft)	$0.86	$0.98	$1.44	$4.98	....	....	....
(hard)	.16	.28	.74	4.28	....	$0.30	$0.37
and steel	.01	.13	.59	4.13	$0.34	.15	....
eral merchandise	.25	.37	.83	4.37	.58	.39	....
n	.095	.215	.675	4.215	.425	.235	.305
r	.24	.36	.82	4.36	.57	.38	.45

Then, the actual losses, if we assume that everything will be ried in the same proportion, become:

Actual loss.

Article.	Tons.	Case 1.	Case 2.	Case 3.	Case 4.	Case 5.	Case 6.	Case 7.
(soft)	1,724,000	$1,482,640	$844,760	$446,861	$257,566	....	....	....
(hard)	658,200	105,312	92,148	87,672	84,513	....	$197,460	$243,534
and steel	2,400	24	156	255	297	$816	360	....
ral merchandise	329,500	82,375	60,958	49,227	43,197	191,110	128,505	....
	329,500	31,303	35,421	40,034	41,665	140,038	77,433	100,497
	251,400	60,336	45,252	37,107	32,883	143,298	95,532	113,130
Total loss	....	1,761,990	1,118,695	645,156	460,121	475,262	499,290	457,161
	....	3,295,000	1,647,500	593,100	98,850	912,800	1,571,000	1,239,100
per ton average	....	$0.53	$0.68	$1.09	$4.65	$0.52	$0.32	$0.37

91. The most favorable of the assumed conditions (case 6) i the one wherein the railroad is allowed to move all the cheap freigh (soft coal) and the canal is given all the higher class of freight but, even under these conditions, the loss would be 32 cents per tor The only way to make up this loss would be for the water carrie to reduce his rate from 78 to 46 cents, and even then he would b only equaling the rail rate. If he improves 8 cents on the rat he will be carrying freight at 39 cents, or at just one-half the rat for an equal distance on the Erie Canal. Again, the conditior imposed—that he must in seven months of the year haul everythin except soft coal, for the whole year—are absolutely impossible. his proportion should drop to 50 per cent of all the high-class freigh he would have to carry it at 20 cents per ton (one-quarter of the Er Canal rate) in order to equal the railroad rate.

92. There is no combination on which the canal can get the freig to an advantage to the public without reducing the Erie Canal ra per ton-mile about one-half.

93. This means that, in addition to the Government's annual lo of $420,000, the canal, if used, would impose a heavy tax on th community. Of course, the result would be that the Governme would have to stand the loss of $420,000 per year and the con munity would use the railroads. When once built the slighte excuse—a few barge loads of hay per year moved from out-of-the-wa places to the railroads, no farther—would be enough to require th operation and maintenance of the canal.

94. In this discussion it has been considered that all freight w make the complete distance and pay 3 mills per ton-mile the who way. Shorter hauls may occur, but the shorter the haul the great the advantage of the railroads; advantages for short hauls are alwa with them. Coal to Cincinnati (200 to 300 miles) goes by rail; Memphis it goes mostly by river.

ARGUMENT.

95. It has been claimed that the assumed elevator charges are t high, and that, by foreseeing one's needs and inviting offers fro various elevators thus stimulating competition, cheaper rates m be obtained. This controversy was settled by three questions a answers. (1) What is the standard charge for elevator service the present time? Answer: Three-fourths cent per bushel in Mi neapolis and 1 cent in Duluth-Superior. (2) Can there be a guaranty that, in case the canal be built and a large commer established, even the standard present rates may not be increase Answer: No, but a raise would not be probable. (3) In your opini would the board be justified in allowing anything lower than t standard charge? Answer: No.

96. It has been claimed that the charge for delivery, landing, a deterioration of soft coal are too high. To these claims it can stated that the charge for delivery in carload lots in Duluth-Superi (and the coal people claim the actual cost is about equal to the charg is 25 cents and no reason can be seen why it will, or can, be done mo cheaply in the Twin Cities. Cincinnati reports the cost of unloadi from open barges to be 25 to 35 cents, and, with fuel so much chea there, no reason can be seen why it should cost as little as 25 ce

ere—especially if it has to be unloaded from decked barges. No eturn freight can be handled in open barges. Regarding breakage 5 cents is generally given as a low figure by the people in Duluth-uperior who handle coal in large quantities. It will be seen that in he General Summation no charge is made for breakage in hard coal. 'here is no doubt that, with a rail rate of $1, and a water rate of 50 to 2½ cents, Cincinnati is reducing its actual receipts by water. The ifference by canal and rail figured herein is only 12 cents on soft and 7 cents on hard coal.

LAKE SERVICE.

97. The service on the Great Lakes is an express service. The essels are large and expensive to run; the rates are low; and they ust be kept moving in order to pay. As a result there have been stablished in Duluth-Superior the most complete system of handling ulk freight—iron ore, coal, and grain—that can be found anywhere the world. Many of the steamers carrying general merchandise d flour are also passenger steamers running on schedules made ut the previous winter. Everything is done with the greatest ssible dispatch. Large lake freighters figure in hours if not in inutes the time they can get their cargoes and get away. They e not going to favor any method of handling freight which will lay them. They must have a full load and have it at once. nal barges must be loaded and unloaded as quickly as the same aterial can be delivered on or received from the wharves. A ssel arrives with 11,000 tons of coal. She can unload at a coal ck in a few hours. It will require 20 barges of 550 tons capacity carry her cargo. They must be on the spot and receive the coal fast as it could be unloaded on the wharves. They must be cked barges if they are going to bring any possible return freight om Minneapolis. The coal must be loaded in the barges through tches and spread out to a depth of 5 feet, whereas on the wharf it dumped in large piles. This is for a single cargo. Suppose 10 al-laden vessels come in in one day; 200 barges must be on hand take it all, and there must be 10 unloading devices ready to start rk promptly. The 10 vessels can go to coal docks and be unloaded. passenger vessel arrives at 10 a. m. She wants 2,500 tons of flour. e must sail at 10 p. m. That amount of flour must be on the arf or on a lighter alongside as soon as she lands. By canal it y be coming down the slope from the Brule River. The vessel ust look out for another cargo or she must go without that earning pacity, and the five canal barges, trailing down the slope, must lay in Duluth, unavailable for return service, until another vessel n receive their flour. The only alternative is adequate terminal ilities with storage, for transfer from boat to barge, where prob-ly the majority of the freight will have to be stored and loaded en craft are available. This means an extra handling and the cost the storage, neither of which has been considered in the above eral summation.

STEAMBOAT CANAL.

98. The board is indebted to Capt. Geo. Winans, a great enthusiast for the canal and a practical steamboat man on the Mississippi River for the cost of running a towboat such as he states would tow 4 barge on the Mississippi River. His figures of daily expenses, taken fron his books are:

1 master and pilot	$8.00
1 pilot	5.00
2 engineers	5.50
2 firemen	4.00
1 cook and helper	4.25
4 men	8.00
2 watchmen	4.00
Fuel	25.00
Supplies	7.25
Oils	1.00
Total	72.00

99. His tow would consist of 4 barges, 135 by 34 by 6 feet, estimate to draw 1 foot empty and 5 feet loaded, the 4 barges carrying 2,20 tons—550 tons each. It will, for the sake of argument, be assume that the canal is a steamboat canal and could carry such a tow. Th distance from Minneaplis to Taylors Falls (open river navigation— half up river and half down river either way) is 92 miles, and the to could make 5 miles per hour or cover the distance in 18.4 hours In the canalized river, and particularly in the canal, where waits a passing points and for other boats to lock through would have to b made and where night navigation would be difficult, it is doubtfu if an average speed of 3 miles per hour could be made. The distanc from Taylors Falls to Allouez Bay is 160 miles, and at 3 miles pe hour would require 53.3 hours. This tow would have to break up a every lock and lift, the 4 barges going through together and the steam boat following. Allowing 20 minutes for the operation of each loc and 35 minutes for each lift (small estimates for a steamboat canal as allowed for a barge canal in House Document No. 69, Fifty-sixt Congress, first session, there would be required for 17 locks (includin that between St. Paul and Minneapolis) and 8 lifts:

$$\frac{(17\times 20+8\times 35)}{60}\,2=20.6\text{ hours.}$$

This gives 18.4 + 53.3 + 20.6 or 92.3 hours, 184.6 hours for th round trip. When the tow reaches Allouez Bay it is quite a distanc from the harbor of Duluth or Superior; there will be considerabl time lost in distributing boats to different points and deliverin them at others for the return cargo besides the time of unloading an loading; and it is not believed that the time so consumed can averag less than 12 hours at each terminus, and it will probably be mor The towboat will be busy all that time and can not take advantage (it for repairs and cleaning boilers. It is not unreasonable to allo 7.4 hours for such work out of every 9 days and the result is that will take 9 days on an average to make the round trip. It will b all that can be expected if one such fleet can make 25 round trips in season, requiring 207 days out of a possible navigation season of onths, or 214 days. Allowing the fleet to be in commission 214 ays, at $72, would cost $15,408. Steel barges of the same dimension s those recommended by Capt. Winans, except that they were 150 et long instead of 135, recently built at Ambridge, Pa., for the St. ouis engineer office, cost $11,120 each, delivered in St. Louis. In he same proportion Capt. Winans's barges should cost $10,000 ach. He estimates that he can put the deck houses and partially ubmerged cargo holds on them, at $2,500 each. He claims that he an build a purely towing steamer of steel that will handle such a eet in the Mississippi River for $20,000. This figure appears samll nd there is grave doubt whether it can be done. It will, however, e assumed that his four barges will cost $50,000 and his towboat 20,000. It is customary to figure on steamboats 18 per cent to over depreciation, maintenance, insurance, and interest (5 per cent) n the investment, and on barges 13 per cent for the same items. ow, 18 per cent on $20,000 amounts to $3,600, and 13 per cent on 50,000 amounts to $6,500. It will be assumed that the plant can laid up in the fall, cared for five months, and put in commission for ,000. The expenses are then—

Operating	$15, 408
Overhead charges on towboats	3, 600
Overhead charges on barges	6, 500
Winter care	1, 000
Total	26, 508

Possible freight, 23×2,200×2=101,200 tons.
Cost per ton, 26.2 cents.

100. This cost allows nothing for office expense, agents at terminals other incidentals—practically supposes that the captain of the at runs his own boat and does the business thereof without even clerk on the boat or a representative at either end of the line. also supposes that he can, without delay, obtain a full cargo for ery barge at each end of the line. It has been shown that, of ch freight as would go by water, four-fifths comes from Duluth- perior and one-fifth goes to Duluth-Superior. On this basis, and nsidering the whole transportation problem, there would be three pty barges to one loaded one on the return trip to Duluth-Superior, d the total freight carried would be five-eighths of 101,200 or 63,250 ns, at a cost of 41.9 cents per ton. This is 1.61 mills per ton-mile ainst 3 mills on the Erie Canal. This was to be expected since the eapest method of handling freight on shallow water is in fleets of rges towed by steamer. It comes nearer representing a large cargo ssel. Therefore, under present conditions of one-way traffic, the y cheapest method of handling cargoes in a steamboat canal uld be 42 cents per ton, and this allows the owner and master of fleet only 5 per cent on his investment and not even salary for him- for 5 months unless he becomes ship keeper and earns a part of $1,000 allowed for winter expense. If not, he gets $8 per day 214 days, or $1,712 for his year's services.

01. It is doubtful if many Mississippi River steamers are run as nomically as Capt. Winans's figures would indicate. His crew of r deckhands (two to a watch) and two firemen (one to a watch) ks small to handle such a fleet without even a mate to boss them. ain, it is very doubtful if any river plant would be built if the fig-

ures on paper could show nothing more than a return of: Wear an tear, insurance, operating expenses of the fleet only (no office o terminal expenses) and 5 per cent on actual cash invested. A larg manufacturer in St. Paul recently stated that money could not b had for such an enterprise unless an income of 15 per cent could b shown on paper.

102. Capt. Winans's business is towing logs and lumber where h picks up the raft when notified that it is ready and drops it on de livery. It is inconceivable that a regular business in moving freigh between two harbors, where shipping may occur at one end from an point along several miles of river front or from either of two town 13 miles apart and at the other end from almost any point of 5 miles of water front, can be carried on without an office and agent i St. Paul, Minneapolis, and another in Duluth-Superior, if not one i each of the four cities. In Duluth-Superior, where four-fifths of th freight will be received, lake vessels will not be waiting for a stean boat man to come and unload them. There is plenty of room fo them to unload their coal and general merchandise and waiting wi not be tolerated. A canal business of any importance would requi outlay at each terminal in the shape of offices and agents to arrang as to where the canal cargo was to be discharged and the return carg to be had. The lake vessel owner or captain will not be lookin along the water front for some fleet of canal boats with 2,000 tons freight to load his lake vessel which will carry 12,000 tons. Termin expenses would be considerable and Capt. Winans's estimate of co does not even allow for a long-distance telephone message. Assum that the freight can be moved at Capt. Winans's figures. We hav seen that if all the freight available were moved by a barge canal 78 cents the loss would be 53 cents per ton. To avoid this loss th canal freight must be reduced to 25 cents to make canal equal railroad. Capt. Winans can move it at 42 cents. Conclusio If the much more expensive steamboat canal were built and Cap Winans's meagerly-equipped outfit could handle all the prese freight in seven months, there would be a loss to the public of 1 cents per ton.

103. It will be seen that in case 5 his rate approaches the rail rat Allowing the barge canal rate of 78 cents, there figures a loss of cents. To avoid this loss only 26 cents can be paid for freig The freight, assuming no coal to be carried, is evenly enough ba anced to make it cost the captain 33 cents and he is only 7 cen behind the railroad rate. In case 6 the barge canal loss was 32 cen on the 78-cent freight rate. Therefore a freight rate of 46 cen could have been paid without any loss. The movement is so ba anced that the captain could have handled the freight at 33 cent showing a saving of 13 cents on 1,571,000 tons, or $204,250. Wi a movement of 1,571,000 tons the reimbursement to the Unit States was 27 cents. Had the movement been decreased so as cost the United States 40 cents, there would have been no saving.

$$\frac{420{,}000}{.40} = 1{,}050{,}000 \text{ tons} = 67 \text{ per cent.}$$

104. In order to equal the railroad there must be carried 67 p cent of everything but soft coal.

105. Similarly, in case 7 the loss on a 78-cent rate was 37 cents.
'here could have been paid 41 cents without loss. The freight move-
ient is so balanced as to have cost Capt. Winans 28 cents, showing
saving by his method of 13 cents per ton on 1,239,100 tons, or
161,083. In case 7 the cost to the United States was 34 cents per
n. Should the amount of freight handled be such as to raise this
st to 47 cents, the captain's saving of 13 cents would disappear.

$$\frac{420{,}000}{.47}=893{,}617\text{ tons}=72\text{ per cent.}$$

106. Advantage must be had of selecting an evenly balanced, high-
ass freight (grain and flour north and hard coal south), and 72 per
nt of it must be carried by the captain's cheap method in order for
m to equal the present railroad conditions.

107. All of this discussion is based on the cost to the United States
the barge canal. In House Document No. 330, Fifty-fourth Con-
ess, first session, it was estimated that a steamboat canal via the
. Louis River would cost 70 per cent more than a barge canal. If
e increased cost of maintenance, operation, and interest on invest-
ent for a steamboat canal via the Brule-St. Croix over that for a
rge canal were 49 per cent, it would entirely wipe out the largest
ving shown for the steamboat method of towing. On the basis of
per cent increase in cost of construction the interest alone would
crease the Government's annual expense by 46 per cent, leaving
ly 3 per cent, or $12,600, for increased cost of maintenance and
eration of a steamboat canal over that of a barge canal.

108. It must therefore be concluded that—

(*a*) Even with the steamboat method of towing, the conditions
cessary to show a saving (having the pick of the freight and neces-
ily moving 67 or 72 per cent of it in the open season) are so vigorous
at they could not be expected to exist—and this with no additional
st to the United States for construction, operation, and maintenance
er those of a barge canal.

(*b*) With the additional cost to the United States of the steamboat
nal, there are no possible conditions which would show the steam-
at method of towing to be as economical to the public as the rail-
ds.

(*c*) The water supply at the summit level has been reported doubt-
for a steamboat canal, and more recent investigations make it
re than doubtful.

(*d*) There is nothing to recommend a steamboat canal rather than
arge canal.

WATERPOWER.

09. Great hopes have been based on the waterpower to be devel-
d along the route. Estimates have been placed on the value of the
ge horsepower to be developed running into very high figures.
paper submitted by the Stillwater Citizen's Canal Association
pendix E) states—

> ssuming that this amount of power (50,000 horsepower) could be utilized in the
> ation of the canal and for commercial purposes and sold at the very low average of
> per horsepower, it would represent an annual income of $1,000,000:

110. A recent investigation of the power possibilities of the S Croix River shows that it is possible to develop 12,650 continuou horsepower in the first 140 feet of elevation above Taylors Falls There remains to the summit level an elevation of 123 feet and water shed of 2,084 square miles.

The Markham-Kelsey project, near the Northern Pacific bridge (t Grantsburg) with a head of 60 feet and a watershed area of 5,67 square miles gives a horsepower of 8,000 (continuous). If, in the sam proportion, all the water above the 140 feet above Taylors Falls Da could be concentrated in one dam it would give 6,000 continuou horsepower. This is a limit no one will claim could be attained. I must not be forgotten that, to a considerable extent, navigation an power development are antagonistic. At the time that the summ level waters must be conserved and held for navigation, the powe developments need them most. Water used to lock boats up or dow the river is water absolutely wasted for power purposes. If the summit level furnishes just enough for navigation in the dry season, will not furnish 1 cubic foot for power purposes. There are only feet fall in the total canalized portion of the Brule, and its summe flow is not more than 200 second-feet, giving about 1,700 continuou horsepower. The small streams crossed by the canal on the Lak Superior slope would give very little horsepower—probably scarcel worth developing, being in such small units. The total watershe of these streams above the canal line is not seven townships or 2 square miles. If each stream could locate a 60-foot dam on the la side of the canal the total development (based on the St. Croix Va ley rainfall and run-off) would amount to 720 horsepower. Thus w have a possible development of 21,000 horsepower (allowing 100 p cent efficiency) instead of 50,000. The figure of $80 (or even $2 per horsepower year appears attractive, but sight seems to be lo of the fact that there will not be a power house, a turbine, a gene ator, or a transmission line included in the Government work developing navigation. An idea of what the Government may e pect to get from these developments may be had from the proje between St. Paul and Minneapolis. The plan, which passed o House of Congress, was to pay the United States 4 per cent $700,000 (the additional cost of the dam, made necessary to produ the power), giving $28,000 per annum to the United States f 15,000 horsepower, on the basis of dam and power-house foundati furnished by the United States. On the St. Croix and Brule Rive there is no estimate for even the power-house foundation, which more expensive than the same length of dam. This allows the Unit States $1.87 per horsepower year. It is understood that the measu failed of passage because it was thought that 4 per cent should paid on $950,000 (the total cost of the dam, the increased height lock, and the power-house foundation), giving a value to the Unit States of $2.53 per horsepower year. The 21,000 possible hors power on the St. Croix and Brule may, therefore, figure as worth the Government an annual rental of from $39,270 to $53,130 wh power-house foundations have been provided. This is small co pared with the $420,000 annual expense of the canal to the Unit States, and very small compared with the Stillwater estimate $1,000,000.

TERMINAL FACILITIES.

111. Adequate terminal facilities exist in Duluth-Superior for
nsfer from lake to rail, equalled in few ports in the world for hand-
g bulk freight. There are no terminal facilities available for trans-
from lake vessels to canal barges. These must be provided either
the shape of floating elevators and derricks for handling freight
ngside the lake carriers at dock or at anchor, in the harbor, or they
y be provided by systems of docks where the lake carrier lies on
side and the canal barge at the other side, the freight being
nsferred across. At St. Paul and Minneapolis there are no
minal facilities except the usual Mississippi River levee at the St.
ul steamboat landing. Practically no terminal facilities suitable
canal purposes exist at either locality but it is presumed they will
ld up if a large commerce demands them. If the board's recom-
ndation be adopted, they will not be needed.

ULTIMATE FATE OF SUCH A CANAL.

12. The Commissioner of Corporations reported in 1909:

> bout 4,500 miles of canals have been constructed. More than one-half—2,444
> s, costing $80,000,000—has been abandoned.

13. It is the firm belief of the board that the construction of the
posed canal would result in an ultimate addition to every one of
figures in the above quotation.

CONCLUSION.

14. The board therefore finds that the proposed canal connecting
e Superior and the Mississippi River by way of the St. Croix
er is not now feasible and practicable, considering the necessary
tion, plans, cost of construction, commerce affected, and water
ply.

C. L. Potter,
Lieutenant Colonel.
F. R. Shunk,
Lieutenant Colonel.
E. D. Peek,
Captain.

APPENDIXES.

APPENDIX B.

atement Made by Julius H. Barnes, Acting Chairman and Representing he Public Affairs Committee of the Commercial Club, Duluth, Minn., at he Public Hearing Held January 15, 1913, at Duluth, Minn.

Ve have listened for so many hours to estimates and forecasts and imaginings and es of tonnage developments to be made by this proposed Lake Superior and Mis- ippi waterway that I almost hesitate to venture to record the opinion of myself l those whom I represent against this project, analyzing it in a commercial way. n, however, delegated to speak the opposition of the Commercial Club of Duluth, ,000 members, after careful consideration, against this project and, with your kind mission, will detail the reasons which lead us to this conclusion.

ne of the most recent works on waterway transportation, a volume by Harold P. lton—Waterways versus Railways—analyzes the various waterways which he has estigated. He refers to European waterways just covered in the remarks of our nd Mr. Harrison, but arrives at very different conclusions as to their justification n those expressed by our friends here. He sums up the situation somewhat as ows:

It is agreed that since the traffic carried on the Great Lakes is tremendous in unt we have there ample proof of the practicability of transportation by water; a little reflection will show that no conclusion in support of river and canal trans- ation ought fairly to be drawn from the Great Lakes. They are a great natural way similar to the ocean itself. They are of ample depth, free from current, and reat width. Moreover, they stretch in a general east and west direction through heart of the continent and in the very pathway of our greatest commerce."

is quite natural that we who live in Duluth on those Great Lakes and seeing the t economy of transportation because of this deep waterway should, perhaps, think word "waterway" is one to conjure with and that anything which merits the name rway must necessarily be an economy of transportation; but a study of this tion has convinced us that there is a great difference between a great deep-water way with only semioccasional interruptions to remove or to improve, and that of allow artificial waterway, every foot of which costs money and effort and a carrying city of which would in the end be very doubtful.

at the Great Lakes themselves have justified themselves beyond any hope on part of the railroads ever competing with them as a carrying facility is beyond tion. I think Maj. Potter several years ago in a Government report first called tion to the fact that the saving in transportation costs in one season alone far more offset the entire cost of all improvements since the beginning of our Government ese Great Lakes, including channels and harbors as well. That this is, with the lopment to-day, far understating the condition is shown by the following figures: season rate per ton of ore from the Head of the Lakes to Lake Erie ports for 1912 een 40 cents per ton. The rail rate from the Head of the Lakes to Lake Erie on ore ranges from \$3.75 to \$4.50 per ton, a saving of \$3.50 per ton on the single of ore, the volume of which for this season through the Soo Canal was 46,303,000 and here we have a saving of \$162,000,000 on this item.

e rate on grain for this season has averaged about $1\frac{1}{2}$ cents per bushel on the lakes. rail rate on grain between Duluth and Buffalo is $20\frac{1}{2}$ cents per hundredweight, .3 cents per bushel, a saving on grain alone of 11 cents per bushel on this tonnage gh the Soo Canal this year, amounting to 243,100,000 bushels, a saving in grain portation costs of \$27,000,000. Westbound, the rate on coal between Buffalo uluth has been about 30 to 35 cents per ton. The rail rate on the same haul is per ton, saving on this one item westbound through the Soo for 1912 on 14,931,000 f about \$41,000,000; a total saving on three articles alone of \$230,000,000 for the eason of 1912.

The most recent figures I have seen on the estimates of expenditures of the Gover ment in all directions on the Great Lakes has been about $100,000,000. One of tl great transportation geniuses of this country is James J. Hill, of St. Paul, the head the Great Northern Railroad. Mr. Hill formerly ran a steamer on the Mississip River below St. Paul. Evidently his judgment was such that he left the wat transportation business on the river and took up railroading instead. He has alwa been a deep student of the transportation problem, and I want to read into the recor a public utterance of his on this point. This is a quotation from the evidence befo the Interstate Commerce Commission, docket 4335:

"Speaking of St. Paul, Mr. Hill got back to one of his favorite themes, the rive He said: 'St. Paul was the head of navigation, but the river had done but little go because Congress had not been able to lath and plaster the bottom. I would rath have a railroad along the river in spite of the competition, because of the low grad it affords. A railroad that is well built, he declared, will give you cheaper transp tation than you can get in any other way unless you can get 20 feet of water. I wo compromise on twelve or fifteen.'"

Now, we have the 20 feet of water. We have still some needs and improvemen to develop along that 20-foot highway. No railroad can compete with it. But wh you propose to build a 7-foot waterway or an 8, 9, 10, or 12 foot waterway, I think t testimony of a transportation student like Mr. Hill is very pertinent regarding commercial possibilities of competition in carrying.

These gentlemen have argued that one of the important influences of a waterwa no matter how shallow, is the controlling of railroad rates. I have had a little pra tical experience of that in our own business as regards the Erie Canal. Twelve yea ago we had a canal rate on grain from Buffalo to New York of 2½ cents per bush To-day we are paying the railroad paralleling that canal 6 cents and the Erie Ca has 7 feet of water and is open seven months of the year, just the same as this ca proposed here. Why has it not been able to hold down railroad rates in that tim The answer is because its carrying possibilities on that depth are limited. The w to control railroad rates is by Federal control such as is being evolved now, and pour the Federal Treasury into commercially useless ditches. A short, shallow wat way is the height of folly. The transshipping charges at either end would kill commercial possibilities. The waterway is limited in its possibilities. It can reach to the individual farm, as a railroad can by its sidings. It can not reach the mines, because mines are usually in hilly and mountainous country, and wat ways can not be constructed in such a country. A railroad siding can run to very mine pit. A waterway can hardly reach the factories which need transportat facilities. The transportation facilities from a deep practical waterway like Great Lakes to a railroad should be the most important subject for the investigat of our transportation expert. That is the problem that remains to be solved to g the full benefit to our great cheap waterway. In view of the rosy pictures pain by the advocates of these shallow waterways and of the developments that follow construction, it seems almost cruel to read a cold-blooded statement into this reco But I want to read this from the reports of 1909 (part 1, p. xv), of the Commissione Corporations on this very subject. He says: "About 4,500 miles of canals have b constructed. More than one-half, 2,444 miles, costing over $80,000,000—has b abandoned."

Gentlemen, the advocates of this canal are wrong, fundamentally wrong. Th is no need for it; there is no tonnage to be developed by it; the tonnage which n exists would never move by it and it would be a most glaring commercial failure

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APPENDIX C.

Superior, Wis., *March 4, 191*

Lieut. Col. Chas. L. Potter,
St. Paul, Minn.
Lieut. Col. Francis R. Shunk,
Pittsburgh, Pa.
Capt. E. D. Peek,
Duluth, Minn.

Gentlemen: At a hearing held at the Commercial Club in Duluth, Minn., Janu 15, 1913, before the board of engineers, to whom this communication is addres representatives of St. Paul, Minn., Stillwater, Minn., Duluth, Minn., and Super Wis., introduced statements of their views as to the advisability of and necessity a survey of a proposed route for a canal to connect the Duluth-Superior Harbor the Mississippi River.

While it was generally understood that the discussion at this hearing was to bear rgely on the desirability of surveying a canal route via the Amnicon, Moose, and . Croix Rivers, most of the statements submitted were of a general nature, bearing the necessity of and benefits to be derived from a canal via some feasible route tween the termini. We shall proceed with our discussion on the theory that in order warrant the expenditure of money by the Federal Government for this purpose, it ust be shown that there is a present commercial necessity for this canal commensu- e with the estimated cost thereof, and that the benefits of such a canal will be despread and not confined to any one locality. It seems elementary to say that e Government should not expend a large sum of money without securing a sub- ntial benefit to a sufficient volume of commerce. It seems equally true that such ge expenditures of money can not be properly made to confer a specific advantage one or two cities in their commercial competition with cities more favorably located waterways, on which the General Government has already expended large sums money to make such waterways more efficient servants of the hinterland back of the t located thereon. To state our position concretely, we believe that careful lysis of the commerce which might be affected by the proposed canal will show t any benefit following the building of this canal would be confined almost entirely the cities of St. Paul and Minneapolis, and would affect their ability to compete h the cities of Superior and Duluth for the great trade of the Northwest, which mally moves through Superior and Duluth. If the advantages flowing from the struction of a canal between Lake Superior and the Mississippi must come largely he Twin Cities, the project is one which should be financed by the Twin Cities, ndertaken at all, and not by the Federal Government.

n considering the business which would be affected by this canal we shall assume t whatever route was selected for the canal the distance from Superior to the mouth he St. Croix is about 230 miles, and that the cost of such a canal and its annual of maintenance would be not less than the amounts estimated for such a canal the Brule and St. Croix route, stated by Maj. Sears at $6,012,500 and $350,000, ectively.

he advocates of this canal have submitted various estimates of the commerce ch would move between the Duluth-Superior Harbor and points in the Upper sissippi River Valley. The latest of these estimates was submitted in connection the statements of Mr. Armson. I have not a copy of this statement, but I shall r to some of the estimates contained therein in a general way as I remember some e most important tonnage items.

r. Armson also called attention to a pamphlet, copy of which was filed, entitled port showing the commercial utility of proposed waterway," submitted to Lieut. Graham D. Fitch, May 31, 1909, by the Citizens' Association of Stillwater, Minn. ve a copy of this pamphlet before me, and wish to call your attention to some of weaknesses of the general scheme of gathering and presenting data which was wed, as well as pointing out incidentally some of the most glaring errors therein ained. After a careful reading of the entire pamphlet I am utterly unable to ermine how the estimates of traffic presented were arrived at. There is no explana- of methods followed, which would indicate that any special effort had been made rrive at a conservative or accurate figure covering any commodity. There is ing to support a conclusion that these estimates are better than the wildest kind guess. Of course every citizen of Superior and Duluth takes pride in the magnifi- showing made by the commerce of the Duluth-Superior Harbor, but in spite of iminatory railroad rates which have long operated to build up the Twin Cities eir northwestern trade, at the expense of Superior and Duluth, it taxes the belief e most credulous to state that "fully 75 per cent of this business is to and from St. , Minneapolis, and other cities located on or tributary to the Mississippi." (Pp. d 13 of pamphlet.) The report continues: "We present herewith a statement ing the receipts and shipments of a number of cities, as we have been able to r them, regarding the bulk or heavy shipments of commodities which could be ed by canal at a considerable saving of freight rates." It is generally true that arger the commercial center the more accurate are the figures obtainable repre- ng the business transactions at that point. As an illustration of this rule it may id that there is no accurate public record of the number of head and kind of live shipped from each of the country shipping points to Chicago, South St. Paul, City, Kansas City, Omaha, or other large stock markets, but there is an accurate fied record of the receipts and shipments of stocks and animal products at each se markets. It is conceivable that errors would naturally occur in arriving at onnage of machinery, canned goods, general merchandise, etc., received from or ed to Superior and Duluth by Minneapolis, but it is very hard to account for considerable error in stating the shipments of flour, millstuffs, and oil cake, cts which Minneapolis is famed for the world over.

At page 14 the shipments of these commodities from Minneapolis to Superior a Duluth are stated as follows for the year 1908:

	Tons.
Flour	708, 351
Millstuffs	129, 503
Oil cake	11, 865
Total	849, 719

During the 12 months ending December, 1908, there were shipped by water fr Duluth and Superior the following tonnages:

	Tons.
Flour:	
Superior	285, 362
Duluth	143, 628
Total	429, 990

The figures for shipments from Duluth and Superior are from Marine Commerce Duluth-Superior Harbor, as compiled under the supervision of Lieut. Col. Graham Fitch, United States engineer, then stationed at Duluth. As Minneapolis shipp 708,351 tons of flour to Superior and Duluth, and only 429,990 tons were shipped fr Superior and Duluth, there were left for consumption in Superior-Duluth and vicin 278,361 tons of flour. The population of Superior and Duluth combined in 1910 118,850 persons. If the 278,361 tons of Minneapolis flour in excess of all lake fl shipments were consumed in Superior and Duluth, each inhabitant used 4,685 pou of flour during 1908. If this tonnage were spread over Superior-Duluth and "iron range," composed of Lake, St. Louis, and Carlton Counties in Minnesota, e inhabitant must have consumed 2,418 pounds of flour in 1908. The report goes or state St. Paul's flour shipments to Superior-Duluth at 590 cars, and says (p. 15): "Tl of course, does not include shipments passing through in transit." Adding St water's 1,500 tons of flour shipped to Superior-Duluth during the same time, assuming that a small part of the other points mentioned sent a small quantity of flo and that country mills in Minnesota, North and South Dakota other than those s cifically named also shipped flour to Superior-Duluth, truly it must be said that sc of the flour went down the lakes in phantom ships which escaped the watchful ey the United States engineer, or the people of Superior-Duluth and vicinity were w derfully well supplied with the "staff of life." Not showing a clear statement of "theory" on which such figures as these are arrived at, I can not see how any va can be attached to such an erroneous statement. If where the greatest accur could be expected there are manifest errors of such importance, what must be tru estimates coming from smaller cities, where there is usually less effort to accurat record tonnage-movement figures?

There seems to be a tremendous confusion of thought in the minds of some pers residing at points along the Mississippi River when it comes to estimating tonn available for shipment on the proposed canal. A few instances will suffice to illust this point: Burlington, Iowa, is said to receive some 30,000 tons of pig iron from Lake Superior district at sixth-class rates. Freight shipments between the L Superior district and Burlington, Iowa, district are governed by the western cl fication, in which there is no sixth class. Sixth-class rates apply from points ea Chicago to Burlington, Iowa, and therefore if 30,000 tons of pig iron were recei at Burlington at sixth-class rates that must have been the territory in which the s ment originated. The pig-iron production for Illinois (outside of the Chicago trict), Michigan, Minnesota, Wisconsin, Missouri, and Colorado in 1911 was 777 long tons, while the production in the Chicago district was 2,954,709 long tons for same period, as reported in Internal Commerce of the United States, published by Bureau of Commerce and Labor. It seems hard to believe that shipments "from Lake Superior district," which must be a small factor in pig-iron production as c pared with Chicago, would move over the Lake Superior and Mississippi Canal Mississippi River to Burlington, about 600 miles, when pig iron does not actually m in any volume from Chicago to Burlington, via the Illinois and Michigan and Henn Canals and the Mississippi River, a distance of about 300 miles. This situa as to pig iron will not be materially changed by the completion of the Minne Steel Co.'s new plant at the Head of the Lakes, because there is no provisio casting pig iron at this large modern plant, where the molten metal will be car directly from the blast furnace to open-hearth steel furnaces, only such ore b reduced as will be necessary for the steel-making requirements of the plant. is shown as an item of tonnage of some importance, and in connection with this tr it must be pointed out that the distance by lake from Michigan salt-producing p

Chicago is the same as or less than the distance from Michigan points to Superior d that Chicago has long been an important salt-distributing point, yet La Crosse, inona, Davenport, Burlington, and Keokuk do not receive salt from Chicago via e connecting canals and the Mississippi River. Why should we expect a traffic in is commodity to move from Superior to the same points of destination over a similar iter route and through a longer average distance?

The secretary of the Davenport (Iowa) Commercial Club, frankly says: "You know, course, that we have a water route from Lake Michigan to Mississippi River, via Illi- is and Hennepin and Michigan Canals. While practically no use has been made this waterway for through service up to the present time, the matter is receiving ention and our shippers expect to receive substantial benefits from the same in the ar future." One end of this canal is at Chicago, near the center of manufactures the United States, and the other end touches one of the richest agricultural States the Union, yet there is no substantial utility resulting from the expenditure of ne $16,000,000 of public funds.

Among the many minor items of traffic said to be seeking a canal waterway to market find shipments of 45,000 tons stoneware and 70,000 tons of sewer pipe made at Red ng, Minn. Sewer pipe and stoneware are very fragile commodities which are much ter suited to continuous shipments over the smooth waters of a river and canal irse than partly by canal with the dangers of transfers and partly by lake subject the rough weather conditions often found on Lakes Superior and Michigan. This nphlet says: "The sewer pipe and pottery is largely Chicago business and could be pped advantageously and at a saving by an all-water route." The most complete utation of this statement is found in the present existence of a suitable water route n Red Wing to Chicago which is not used. Are we to conclude that this business uld move north to Superior, be transferred there, and then proceed around "the rn" via Lakes Superior and Michigan to Chicago, when it will not move by river l canal over a shorter route? If this is sound logic, we may expect a tremendous wth in the traffic between New York and Seattle around Cape Horn after the open- of the Panama Canal.

What traffic, then, may be expected to develop on this canal?

LOCAL TRAFFIC ALONG THE CANAL ROUTE.

The northern Wisconsin territory along the route of the canal is adapted especially dairying, small-fruit raising, and truck farming. Along the southern end of the al dairying and potato raising are the principal farm occupations, while the small ns raised are largely rye and barley, which are produced in comparatively small ntities. In marketing the products of the dairy, small-fruit or truck farm, every- ng depends upon quickness of delivery to points of consumption; so we could not ect such business to patronize the canal. The potato crop would not begin to move il about the time the canal season of navigation was over, so a very small tonnage ld be derived from this source. The rye and barley raised finds its biggest market Milwaukee, St. Louis, and the Southeast, where the largest breweries and dis- ries are located. If a water movement of this traffic were to be expected at all, ould be south via the Mississippi through St. Louis. This statement would hold for the coarse grains produced along the Mississippi in southern Wisconsin, south- Minnesota, Iowa, and Illinois.

ER TRAFFIC WHICH MIGHT USE THE PROPOSED CANAL, AND THE PROBABILITY OF SUCH USE, IN VIEW OF RAILROAD RATES AND COMMERCIAL CONDITIONS.

rain traffic.—For the reasons stated in the previous paragraph there would be no stantial movement of grain from grain-growing territory in Wisconsin, Minnesota, a, and Illinois lying adjacent to the Mississippi and south of St. Paul. The luction is confined largely to coarse grains, which do not usually seek a market ugh the port of Superior-Duluth, but in an opposite direction. The principal at-producing section lies west of Minneapolis and north of a line drawn due west St. Paul, including central and northern Minnesota, northern South Dakota, of North Dakota, and parts of Montana. From Montana and practically all of h Dakota and northern and northwestern Minnesota the freight rates on grain the same to both Minneapolis and Superior. From South Dakota and south- ern Minnesota Minneapolis rates are from 2 to 4 cents per hundred less than rates from the same points to Superior. In the larger part of the territory the rentials are 2 and 3 cents. The grain coming from this territory is largely wheat, h is either milled at the Twin Cities, going forward from that point as flour, is ped from the Duluth-Superior harbor east by lake to be milled in consuming territory or is milled in transit at small interior mills from which the product g east to the larger consuming territory. Mills located at points south of the Tw Cities on the Mississippi either buy in the grain fields to grind in transit for Chica territory or east thereof or would naturally buy from the Twin Cities to fill th requirements at the rates in to the Twin Cities are equal to or less than those Superior, while the rates from the Twin Cities to the mill are less than from Superi The price of No. 1 northern is the same or higher in the Duluth-Superior mark than at the Twin Cities, therefore grain purchased at Superior or Duluth would alwa cost the purchaser, at Winona or La Crosse, for instance, the difference in price, if an between Minneapolis and Duluth plus the higher cost of transportation by rail canal from Superior to the Twin Cities, as compared with the short rail or river ha from the Twin Cities to La Crosse or Winona. The situation here depicted hol true of other commodities originating at points along the Mississippi and destined northwestern consuming points. For example, the rates from Superior-Duluth Grand Forks, N. Dak., are the same as from St. Paul to Grand Forks. Pottery or sew pipe from Red Wing, destined to Grand Forks, would naturally go through St. Paul cause the local rail rate to St. Paul is less than to Superior-Duluth, or the Mississip River to St. Paul would be used instead of the river and canal to Superior because the smaller expense for the short haul. Such classes of prospective traffic as this c not be said to demonstrate the economic necessity of a canal from the Mississippi Lake Superior.

Grain, as stated before, comes to Minneapolis on the basis of a local rate, which is same as the rate to Superior, or from 2 cents a hundredweight or 40 cents a ton lowe 4 cents a hundredweight or 80 cents a ton lower than the rate to Superior. Grain co ing from points where the shipments route through the Twin Cities may be stopped Minneapolis and offered for sale on that market and failing, such sale may be forward to Superior or Duluth on practically the same rate basis as if the shipment trave through to destination without stopping in transit. Shipments coming from territ which would not route through the Twin Cities may be forwarded to Superior-Dul at 5 cents a hundredweight. or $1 a ton more than the local rate to Minneapolis.

On the basis of a margin of 40 cents, 60 cents, 80 cents, or $1 a ton, would grain m through Minneapolis via the Mississippi River and canal to Superior or Duluth if proper charges were assessed against the traffic? The New York State canals wo present conditions of operation similar to the proposed canal, having regard to the de of water and type of barge.

Below we present some statistics which should throw considerable light on the operating cost of this canal.

Statistics for New York canals.

[From Census Reports on Transportation by Water in 1906.]

Cost of proposed canal	$6, 012, 500
Interest per annum, at 3 per cent	180, 375
Maintenance cost per annum, based on Maj. Sear's report	350, 000
Total interest and maintenance per annum	530, 375
Number of tons required to pay interest and maintenance at 40 cents per ton	1, 325, 947. 5
Number of tons required to pay interest and maintenance charged at 20 cents per ton	2, 651, 875. 0
Total tons transported on New York canals	3, 540, 907. 0
Tons of through freight on New York canals	1, 006, 414. 0
Tons of way freight on New York canals	2, 534, 493. 0
Wages of employees on New York canals	$726, 402. 0
Wages of employees per ton carried on New York canals ($726,402 divided by 3,540,907)	0. 2
Value of canal boats on New York canals	2, 952, 197. 0
Interest on value of canal boats at 6 per cent	177, 131. 8
Interest on boats per ton carried ($177,131.82 divided by 3,540,907)	. 0
Cost of elevation at Mississippi River per bushel	. 0
Cost of elevation at Mississippi River per ton	. 15
Cost of elevation at Superior-Duluth Harbor per ton	. 15

The cost of elevation per bushel is based on the cost at Buffalo as stated on page 315 f the 1911 Statistical Abstract of the United States.

Cost per ton for interest on wheat delayed in transit (wheat at 90 cents per bushel nd canal and river time estimated at 5½ days against 24 hours rail transit), 2 cents.

The above estimate is for movement only and takes no account of probable delay switching to elevator on the river or for delay in river transfer elevator due to con-estion and irregularity of canal boat traffic.

Cost of switching, if from Minneapolis local elevator to river front transfer elevator ear St. Paul based on switching charges in G. N. I. C. C. A. 3,140 per ton, 20 cents. If from connecting line to St. Paul water front through business, 10 cents ton.

Cost per ton St. Paul or Minneapolis to Superior.

	If total tonnage moved were 1,325,937.5 tons.	If movement were 2,651,875 tons.
	Cents.	*Cents.*
r interest on cost of canal and maintenance	40	20
ages of employees	20.5	20.5
terest on investment in boats	5	5
st of elevation at river	15.65	15.65
lay in transit	2	2
itching from connecting line to St. Paul water front on through business	10	10
	93.15	73.15
rom Minneapolis local add 10 cents for switching [1]	10	10
	103.15	83.15

Switching, Minneapolis to St. Paul, 20 cents per ton, as compared with interchange switch of 10 cents ton.

It is apparent that under the above conservative statement of costs, which takes no count of insurance cost, higher wages for employees paid in the Northwest, as com-red with New York, or higher cost of materials for boats, as compared with the East, d extremely low estimated elevation charges at Buffalo, which probably could not equaled on a less efficient plant handling a smaller business on the Mississippi ter front at St. Paul, there could be no substantial movement of grain on the pro-sed canal from the Twin Cities to Superior.

Would flour move on this canal?

The railroads owning docks at Superior or Duluth offer free storage for flour for lake pment which enables the Minneapolis miller to have a large amount of his product the port to move at the opening of the lake season of navigation long before a similar ount of his products could be moved via the canal for early shipment. In addition hastening the actual movement of his product, the placing of these goods in transit ore the assessor gets around in the spring saves the taxes which would be assessed these products if they were in the mill warehouse awaiting shipment via the canal. anything like equal costs of movement via the canal, compared with rail move-nt, the privilege of storage at railroad docks and the opportunity to escape the ing assessment of taxes would give the rail route a very large proportion of the pments. The lake and rail rate on flour from Minneapolis to Eastern destinations cents per hundredweight, or $1 per ton greater than the lake and rail rate from perior to the same destination. Using the figures previously given for grain and stituting a conservative estimate of 35 cents per ton for warehousing and handling n car to boat at St. Paul for the elevation charge previously shown, it appears t shipments moving via St. Paul rail and canal to Superior would cost from $1.04 $1.24 per ton if from Minneapolis local, or from 94 cents to $1.14 per ton if from nts beyond. As before stated, these figures do not include anything for marine urance and other proper charges.

he above estimates for handling flour are higher than rail costs without charging ent against the traffic for warehousing and handling at the Lake Superior destina-n. No substantial movement could therefore be expected.

Coal.—The United States Geological Survey Production of Coal in 1909 places th amount of coal mined and prices at mines as follows:

	Shipments.	Price pe ton.
	Tons.	
Illinois	46,595,285	$1.
West Virginia	43,948,303	.

The largest volume of coal moving through the Duluth-Superior Harbor is soft coa coming very largely from West Virginia. The rail rate on coal from a large group Illinois points to St. Paul-Minneapolis is $1.40 per ton. Adding freight to avera mine cost stated above, Illinois coal would sell on St. Paul-Minneapolis market at $2. per ton plus storage, handling, and dealer's profits. The rail rate from a large part the West Virginia coal mining territory to Lake Erie points when for lake shipme is 80 cents per ton. The lake rate from Lake Erie to Superior is 30 cents per ton a the rail rate from Superior to St. Paul is 90 cents per ton. Mine cost 86 cents p transportation expenses of $2 through Superior to St. Paul makes West Virginia c worth $2.86 per ton, plus cost of handling at Superior-Duluth docks (3 cents ton b to dock plus 10 cents from dock to car), 13 cents would mean a total cost of $2.99 a t at St. Paul, plus storage and handling at St. Paul and dealer's profits. It is appare that Illinois coal shipments directly limit the amount of eastern coal which can be s at the Twin Cities. A reduction of 54 cents a ton in the rate from Superior to St. Pa would be necessary to make the cost of laying West Virginia coal down in St. Paul t same as the cost for Illinois coal. Reliable statements from coal dock officials at Super indicate that less than 25 per cent of the coal received at the Superior-Duluth Harb is shipped to St. Paul and Minneapolis. In general it may be said that the larg movement of coal from Superior and Duluth docks does not take place until abo what would be the close of a canal season of navigation, which would reduce very ma rially the tonnage available for canal shipment. The present system of handling t coal business is based on the storage of tremendous coal supplies at Superior and Dulu and shipment to retailers and manufacturing plants at times which suit their conv ience and allow plants to keep their current investment in fuel down to the low possible point. In order to ship coal by canal to the Twin Cities, it would be necess to make large coal stock piles at or near St. Paul on the Mississippi River. The nec sity for keeping various advertised individual kinds of coal separate and the sm volume of each concern's business handled at such points would not warrant the inst lation of expensive handling machinery to transfer the coal shipments from the bar to the dock and from the stock pile to cars. In loading coal by hand from stock p to car, a cost of from 30 to 40 cents per ton is incurred for handling. This is the ex rience of operators of Superior coal docks. If to this handling charge we add someth for return on barges, wages of canal employees, and switching from stock pile on Mississippi to points in St. Paul or Minneapolis, it must be apparent that no substan saving under present rail rates would be effected. In addition to the items of c already mentioned something would necessarily have to be added for rent of d space or land on the Mississippi River, as well as losses due to additional handl received by the coal. That losses from handling coal are substantial is attested by fact that coal docks located at Superior have installed the largest briquetting pla in the United States, if not in the world, to put coal screenings and dust in marketa form. It is confidently stated that what has been said above will be substantia by the most thorough investigation, and it is our sincere belief, therefore, that estimated traffic in coal, grain, and flour would not materialize.

As to iron and steel goods, canned goods, sugar, salt, and cement from eastern poi of production, it is only necessary to point out that the present lake and rail rate the Twin Cities are but 2 cents per hundredweight, or 40 cents per ton, more than rate to Superior, and that a certain amount of free storage in transit is allowed on Twin City business. The 40 cents per ton difference would not go far to provide handling charges at St. Paul and switching from docks to warehouse, to say nothin the free-storage privilege which would be lost to manufacturers or jobbers.

What, then, is the reason why people of the Twin Cities and immediate vici wish to see this canal built? The Twin Cities have long been the beneficiaries system of discriminatory lake and rail rates. Communities on all sides of them, cluding Kansas City, Sioux City, Mankato, Albert Lea, and Red Wing have complai to the Interstate Commerce Commission of such discriminations. There is now pe ing before the Interstate Commerce Commission a complaint of the Duluth Com ial Club against these unjustly discriminatory rates. A canal from Lake Superior to e Mississippi River would give theoretical or "potential" water competition which ould go far to justify and perpetuate the iniquitous system of rates which now exists. ome of those who favor this canal have contended that the canal would "regulate" eight rates. Ever since February 4, 1887, and more especially since the passage of e Hepburn and Mann-Elkins laws of 1906 and 1910, the Federal Government has ken the position that railroad rates and fares can and must be regulated by an admin-trative body clothed with adequate powers to investigate and decide such questions.

If the communities interested in the building of this canal are not receiving fair eatment at the hands of rail or rail and lake carriers, they should seek redress through e Interstate Commerce Commission, not through the expenditure of some $6,000,000 more of public funds, which might not prove efficient in either regulating rail rates serving commerce as would seem to be the case with the Illinois-Michigan-Hennepin nals connecting Lake Michigan and the Mississippi River. All of which is respect-lly submitted.

Yours, very truly,

J. A. Little, *City Statistician.*

APPENDIX D.

[The Public Affairs Committee of the Commercial Club of Duluth.]

Duluth, Minn., *January 23, 1913.*

r. E. D. Peek,
Captain, Corps of Engineers, U. S. Army, Duluth, Minn.

Dear Sir: In considering the commercial possibilities of a canal from Lake Superior the Mississippi River, it seems proper and fair to take up the movement of various mmodities between Duluth-Superior Harbor and the Twin Cities, both locally and stined to points beyond, the volume of such movement in total, and during both e open and closed season of navigation upon the canal, the railroad rates for the nsportation of such commodities, the service performed by the railroads as com-red with that which might reasonably be performed by the canal, the railroad rates such transportation, and the possibility of rates being made for transportation on e canal low enough to attract traffic from the rail lines and affect the rail rates.

As the southbound movement will probably considerably exceed the northbound ipments in the future, to at least as great an extent as at present, consideration will given to that traffic first.

COAL MOVEMENT.

For the season of 1911 there were received by lake at Duluth-Superior Harbor 64,568 tons of hard coal and 7,070,337 tons of soft coal.

Hard coal is used mainly for house heating during the winter months, and the ship-ents from the head of the Lakes move almost exclusively during the late fall and nter when the canal would be closed to navigation. It therefore seems fair to minate the hard-coal tonnage, unless it can be shown that the rates on the canal n be made low enough to warrant the shipping, prior to the close of the canal, of ge quantities for storage at the Twin Cities or other points. This feature will be ken up later.

Soft coal is used the year around, but a much greater tonnage is consumed during winter months than during warm weather, as this class of coal is used largely in heating of large buildings, and even steam plants require more fuel during the nter than in the summer.

Presuming for purposes of argument that the demand is uniform throughout the ar and the shipments each month are about equal. The largest estimate presented the hearing was that 50 per cent of the receipts at Duluth-Superior harbor goes to Twin Cities and beyond. Fifty per cent of the 1911 receipts of soft coal was 35,168 tons, equal to 294,597 tons per month. The canal would not be open for ffic over seven months in the year, and for that period 2,062,179 tons would move der normal conditions. This movement, like that of hard coal, is dependent upon canal rates and service.

SERVICE.

oal transported by rail is loaded into cars at the docks at the Head of the Lakes, l delivered next day to consignees in any part of the Twin Cities without any litional charge beyond the freight rate from Duluth to St. Paul. Shipments by canal would have to be unloaded and loaded into cars for delivery at points of destin tion, not located on the canal. Coal transported by canal could not be delivered consignees in the Twin Cities in less than five days on the average.

The price of coal f. o. b. cars at Duluth is 25 cents per ton less than the price of th same coal f. o. b. barges at Duluth. The deterioration on coal in the transfer fro barges to cars is estimated by the coal-dock managers at Duluth-Superior harbor to b about 20 cents per ton. The charges at the Twin Cities for moving coal from the can terminals to industries or team tracks would be, on a distance tariff basis, as follow

Miles.	Rate.	Miles.	Rate.
	Cents per 100 pounds.		*Cents per 100 pounds.*
5	3	25	5
10	3	30	5
15	3	35	6
20	4	40	6

The rates from the canal terminal to destination on rail lines would depend up the location of the canal terminals.

To sum up, the cost of delivering coal from Duluth to on board cars at the canal t minals, exclusive of the charge for transportation on the canal, would be substantial as follows:

	Per ton.
Extra charge for loading barges	$0. 25
Deterioration	. 20
Transfer barge to car	. 15
Total	. 60

The rail rates from Duluth to the Twin Cities are $1.25 per ton on hard coal and cents per ton on soft coal, leaving 65 cents per ton on hard coal and 30 cents per ton soft coal to cover the canal charge from Duluth to the Twin Cities and the rail char from the canal terminal to final destination in the Twin Cities.

From this it would seem doubtful if the canal could equal the rail rates, and pra tically impossible for the canal to offer rates enough lower than those of the rail lin to attract any considerable tonnage for the Twin Cities locally.

As to coal traffic from Duluth destined to points beyond the Twin Cities which mig move by canal. The rail rates from Duluth to such destinations are substantially t same as the rates to the same points from Lake Michigan ports and from mining poi in Illinois. The following table shows the rates from Duluth to representative poi beyond the Twin Cities, and the local rates from St. Paul:

Rates per net ton.

To—	Through rate.		Local from St. P	
	Soft.	Hard.	Hard and soft.	Har
Rochester, Minn	$1. 40	$2. 25	$2. 00	......
Waseca, Minn	1. 40	2. 00	1. 60	......
Owatonna, Minn	1. 40	2. 00	1. 80	......
Austin, Minn	1. 40	2. 00	2. 00	......
Mankato, Minn	1. 50	2. 05	1. 60	......
New Ulm, Minn	1. 80	2. 05	1. 60	......
Pipestone, Minn	2. 00	2. 25	1. 85	$2
Sioux Falls, S. Dak	2. 40	2. 50	1. 25	2
Huron, S. Dak	2. 55	2. 80	2. 15	2
Aberdeen, S. Dak	2. 55	2. 80	2. 55	2

MERCHANDISE.

Westbound general merchandise traffic destined to the Twin Cities is handled on rough rates which are the following differentials higher than the rail and lake rate Duluth, governed by official classifications:

asses	1	2	3	4	5	6
nts per 100 pounds	15	13	9	5	4	2

Iron and steel articles, 2 cents.

A very large percentage of special commodity rates, 2 cents.

The canal boats could not reduce these figures and live.

The lumber manufactured in Duluth is shipped east by lake.

This is substantially of the southbound traffic.

NORTHBOUND.

The claim has been made that flour, grain, and manufactured articles will furnish eavy northbound tonnage.

The mills at Minneapolis are located above any possibility of navigation on the ssissippi River, so far as the proposed canal is concerned, therefore there will be a l movement from the mills to the canal. The transfer, estimated from the experi- e at Duluth in unloading from cars and loading on board vessels, would be 30 cents ton. The same charge would be made at Duluth for transferring from barge to e vessels. This would make a charge of 60 cents per ton for handling alone. The portional rate on flour by rail from Minneapolis to Duluth is 5 cents per 100 pounds $1 net ton. Deducting the canal handling charges leaves 40 cents per ton out of ich to pay the rail charges from the mills to the canal and the charges for canal nsportation to Duluth.

lour and package freight can not be handled to advantage in the same type of ge as coal and other bulk commodities, and a coal barge would have to be throughly aned before loading with flour.

rain is not shipped locally from the Twin Cities to Duluth. Such grain is handled a proportional rate not exceeding 5 cents per 100 pounds, or $1 per ton. The k of the grain moving from Minneapolis to Duluth is handled on through rates n points of origin to Duluth.

he through rates from points on the Great Northern Railway in southwestern nesota, Iowa, and South Dakota to Duluth, in no case exceed the rates from the e stations to Minneapolis by more than 3 cents per 100 pounds, or 60 cents per ton.

n order to attract grain shipments to the canal, a rate materially lower than 60 ts per ton would have to be made between Minneapolis and Duluth. Grain ld not be handled in a coal barge, unless the barge was subjected to a thorough ning before the grain was loaded. The elevators in the Twin Cities are not located s to load direct to barges. This would necessitate a rail movement from elevator arge and a transfer charge of at least 20 cents per ton from car to barge.

n all merchandise traffic through Duluth both east and westbound, there is a kage charge of 40 cents per ton, which is absorbed by the rail lines. Some arrange- nt would have to be made by the canal boats to take care of this charge.

ll of the rail rates include insurance against loss and damage. The matter of ms has not been referred to, as it does not seem necessary to go further into details iew of the impossibility of the commercial success of the canal.

he rail rates are so adjusted, and the transportation conditions so unfavorable to al traffic, that there seems to be very little possibility of rates being made on the al, which added to the various charges incidental to transportation via that agency, ld meet the rail charges, and no possibility of canal rates being made low enough nfluence the movement of traffic by rail or affect the rail rates.

ll of which is respectfully submitted.

Yours, very truly,

C. Roy Hall,
Traffic Commissioner.

APPENDIX E.

[In the matter of the proposed Lake Superior-Mississippi canal.]

To the Board of Officers,
Corps of Engineers, United States Army,
Duluth, Minn.

Sirs: In response to your circular letter of November 19, 1912, requesting info mation from interested persons on the character, amount, and value of commerce th would be affected directly or indirectly by the proposed canal connecting La Superior with the Mississippi River, the St. Croix River Improvement Associati and the Citizens' Association of Stillwater, Minn., appointed the undersigned co mittee to gather such data as might be available, and to compile and submit the sa to you for your information.

In the circular letter above referred to information was particularly desired on t following points:

(*a*) The present and prospective business of the locality in character and amou development of water power, etc., and particularly the kind and amount of ves commerce and present facilities for conducting the business.

(*b*) What kind of improvement is desired by those who caused the above items to inserted in the river and harbor bill.

(*c*) With reference to the proposed canal, the character and amount of commer and its value that would probably be carried by the proposed canal or that would affected directly or indirectly by it; the extent to which it would probably promo the general business or industries in any localities or sections of the country, and a other data which might have a bearing upon the question in hand.

Subdivision A.—The information requested in subdivision (*a*) in reference to t present and prospective business in character and amount of the localities that wou be affected by the proposed canal will be included in our response to the questio contained in subdivision (*c*).

In the matter of the development of water power, this committee is unable submit any reliable data on this subject for the reason that no survey of the propos canal route between Lake Superior and the St. Croix River by way of the Amnic and Moose Rivers has yet been made, and until at least a preliminary survey is ma it would be impossible to report on the probable water power that could be develop on these rivers.

It was conservatively estimated that more than 50,000 horsepower could be dev oped on the route by way of the Brule River and upper St. Croix lakes survey under direction of Maj. Clinton B. Sears in 1898, but we are unable to say whet the amount would be greater or less on the Amnicon Moose River route.

In reference to the kind and amount of vessel commerce and the present facilit for handling the same, we assume that this question refers more particularly to Duluth-Superior harbor, upon which we have no information to offer.

Subdivision B.—The improvement desired is a barge canal. The width and de of such a canal is entirely an engineering matter. Maj. Sears's estimate of the cost such a canal was based on a width at the water surface of 80 feet, 59 feet wide at bottom and 7 feet deep. It has been suggested that a depth of 8 feet would aid grea to the carrying capacity of the canal. Upon this subject, however, we have no s gestions to offer but simply call attention to the suggested depth of 8 feet.

Subdivision C.—In a report submitted to Lieut. Col. Graham D. Fitch, under d of May 31, 1909, by a committee of the Citizens Association, of Stillwater, Minn. copy of which is hereto attached,[1] the character and amount of commerce that wou probably be carried by the proposed canal, and the probable effect it would have freight rates was covered in considerable detail. The date submitted at that ti has been revised and brought down to date by the present committee, a summary which is herewith attached for your information.

The territory that would be affected, either directly or indirectly, by the build of the proposed canal embraces practically all of the five States bordering on Mississippi River, Minnesota, Wisconsin, Iowa, Illinois, and Missouri. These Sta contain a population of more than 16,000,000 people and have an area of 310,815 squ miles. They are among the most prosperous and progressive States of the Uni The varied resources and wonderful fertility of the Mississippi Valley justifies opinion that eventually it will be one of the greatest and most populous sections our country. It is not unreasonable to estimate that these States will have a pop tion of at least 25,000,000 people within the next 20 years.

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[1] Not attached; printed in H. Doc. 304, 61st, 2d sess.

During the past 20 years the industrial and commercial growth of the Mississippi alley has far outstripped its growth in transportation facilities. This unequal owth has resulted in frequent freight congestion in the commercial centers of the iddle west in recent years and has adversely affected our industrial development. is highly improbable that these congested conditions will be relieved by increased ilroad facilities in the near future. An eminent railroad authority, Mr. James J. ill, estimated a short time ago that it would take $5,000,000,000 to furnish the railads of the country with adequate facilities in trackage, terminals, and rolling stock enable them to properly care for the traffic of the country.

These conditions make it imperative that we should utilize our waterways for ansportation, especially for the transportation of heavy and bulky commodities. is estimated that it would take $500,000,000 to put all the principal waterways in ndition for profitable steamboat and barge transportation—just one-tenth of what r. Hill says is needed for perfecting the railroad system. It is possible that by the ne that Mr. Hill's $5,000,000,000 was expended on railroads, traffic will again have increased as to demand a yet further laying of tracks and expansion of terminals. ile waterways once constructed admit of indefinite expansion of traffic without largement.

It is not necessary, however, to dwell on the economic value of waterways in the velopment of the industrial and commercial welfare of a country. Such value is w generally recognized by every thoughtful student of transportation problems. considering any comprehensive scheme of waterways development, however, the ue of each specific project must in the end be determined by its commercial utility. is our purpose, therefore, to present in this report certain facts and data bearing on commercial value and utility of the proposed canal connecting Lake Superior h the Mississippi River.

We believe that such a canal would be of immense value to the entire upper Missippi Valley as well as the adjacent territory. The cheaper freight rates afforded water transportation as compared with rail would greatly stimulate trade and nmerce and would aid materially in our industrial progress. The saving in the t of transporting such heavy articles of commerce as coal, iron, lumber, cement, e, salt, sugar, heavy hardware, and building and crushed stone would alone justify building of such a canal.

s coal and iron constitute the greater part of the cost of a large and growing line of nufactured products, and as the future industrial growth of the Mississippi Valley l depend largely on the availability and cost of these commodities, the value of proposed canal as affording the cheapest possible method of transporting these portant articles of commerce will be first considered.

n the territory tributary to the proposed canal the consumption of coal is convatively estimated to exceed 10,000,000 tons annually. The receipts of coal in Duluth-Superior Harbor alone in 1911 exceeded 8,500,000 tons. At least 60 per t of the latter is shipped to the Mississippi and Minnesota river valleys. The sent rail rate to St. Paul and Minneapolis is $1.25 for hard and 90 cents for soft coal, le the rate to points in the Minnesota valley is the Twin City rate plus the local . It will be generally conceded that canal transportation would not only effect nsiderable saving in freight charges from Duluth to down river points but would effect a considerable saving in rail rates on coal from Illinois because of competition. ssuming that 50 per cent, or 5,000,000 tons of the total coal consumption would be cted by canal transportation or canal competition to the extent of 40 cents per the saving in freight charges on this commodity alone would amount to $2,000,000 ually.

is difficult to obtain any accurate data as to the quantity of manufactured and iron shipped into this territory. A careful estimate places the amount at 1,500,000 annually. A saving of 40 cents per ton on freight charges would amount to ,000 per year on iron shipments.

ut the benefits of a canal in so far as it affects the shipment of iron products is of h greater future importance than present shipments would indicate. When the steel plant now in course of construction at Duluth is completed the head of the es will become one of the great distributing points for iron-ore products. More 1,400,000,000 measured tons of iron ore were reported for taxation in Minnesota 912, and there are still thousands of acres of the ore belt that have not yet been ored, so that it is safe to say that the ore deposits of the State will be ample to t the needs of this immense steel plant for more than a hundred years to come. means that for the next century millions of tons of iron ore products will be ped annually from Duluth to points in the Mississippi Valley and tributary tory.

e proposed barge canal would permit of the shipment of pig and manufactured to points on the Mississippi at less than half the present cost of shipping by rail and would greatly stimulate the industrial development of every manufacturing cit in the Mississippi Valley.

In addition to coal and iron, there are many other commodities that could be shippe by canal to points on the Mississippi for consumption at such points or for distributio to interior points at a considerable saving in transportation charges. The shipment into the canal districts of salt, cement, lime, sugar, and other articles of heavy me chandise that could be profitably shipped by water aggregate fully 1,500,000 to annually. A saving of 60 cents per ton on these commodities would mean an annu reduction in freight charges of $900,000.

While the water power that could be developed by the building of the necessar locks and dams in the construction of the canal by way of the Aminicon-Moose Riv route can only be conjectured, if such power equals the power on the Brule route would approximate 50,000 horsepower. Assuming that this amount of power cou be utilized in the operation of the canal and for commercial purposes and sold at t very low average of $20 per horsepower, it would represent an annual income $1,000,000. It is not improbable that in the near future electricity will not only the motive power in factories but will take the place of steam on many of the railroa systems of the country. When that time comes the value of the horsepower that cou be developed on the proposed canal route would be enhanced manyfold. T development of the water power is one of the important benefits that will accrue fro the building of the proposed canal.

Summarizing the above items we get the following results as representing a n annual saving in freight on these commodities to which is added the estimated inco from water power:

Coal	$2,000,000
Iron	600,000
Salt, cement, sugar, etc	900,000
Water power	1,000,000
Total	4,500,000

The above estimate does not include many other articles of commerce upon whi freight rates would be materially reduced because of cheaper water transportati such as lumber, brick, crushed rock, building stone, flour, grain, and other agric tural products, the aggregate of which would amount to hundreds of thousands dollars annually, not alone because of the cheaper cost of water transportation b also because canal rates would have a decided influence in preventing excessive r rates.

Assuming the cost of the proposed canal to be $10,000,000 and the annual cost maintenance at $350,000, the four items given in the above table would represent annual return of 41.5 per cent on the investment.

Taking up the present necessity of the proposed canal we are aware of the adve report on the commercial value of the undertaking made by Maj. Sears in his rep of 1896 and in his supplementary report of 1899. Both reports pointed to the f that three lines of railway almost parallel the proposed canal and afforded adequ shipping facilities at that time. These conclusions were probably justified by c ditions at that time, especially if facility rather than cheapness is to be the det mining factor in transportation problems. But conditions have undergone gr changes in the Middle West in the past 15 or 20 years. The development of the up Mississippi Valley during the period has been simply marvelous. Its growth population, in agriculture, in commercial and industrial activities, has brought face to face with transportation problems that did not exist 20 years ago.

Perhaps no better illustration of the rapid industrial and commercial growth of Middle West could be given than by comparing the vessel tonnage, the freight t nage, and the tonnages of certain raw and manufactured materials passing through Soo Canal in 1894 and 1910. The following figures are compiled from the Mont Summary of Commerce and Finance issued by the Department of Commerce a Labor, December, 1911:

Growth of Soo Canal traffic, 1894–1910.

	1894	1910	Increase.
			Per cent.
ssel tonnage	13,110,366	49,856,123	280
eight tonnage	13,195,860	62,363,218	373
al, tons	2,797,184	13,513,727	383
n ore, tons	6,548,876	41,603,634	535
anufactured and pig iron	60,659	444,669	633
nclassified freight	415,180	1,411,549	240

These figures afford some index to the marvelous commercial growth of the Middle est in recent years. The greater part of the tonnage passing through the canal ward reaches the head of Lake Superior and is distributed in northwestern Wis- nsin, Minnesota, and North Dakota, while the tonnage downward originates mainly Minnesota, two-thirds of the total being iron ore. While there will be a substantial crease in the ore shipments when the steel plant is completed at Duluth, there ll be a corresponding increase in manufactured products to be distributed in the ddle West when this plant is in operation.

The commercial value and utility of a canal connecting the Great Lakes with the ssissippi River will be greatly augmented with the opening of the Panama Canal. would afford an outlet by water for the commerce of the Lake ports destined for cific coast points, thus enabling such ports to better compete with Atlantic coast rts—something they will be unable to do if they are obliged to reach the Pacific st by rail. Unless the Middle West utilizes the Mississippi and its tributaries in nection with the Panama Canal for shipping and receiving Pacific coast freight vill find itself greatly handicapped in the race for commercial supremacy—perhaps its commercial existence.

he East should not be permitted to dominate the trade that will pass through the ama Canal. But unless the Middle West takes note of what is transpiring and pares to meet the situation it will awake to find that its hope of commercial great- s was but a dream. The serious situation of the Middle West is greatly intensified free tolls through the Panama Canal for coastwise steamers. It is imperative tilize our waterways to the fullest possible extent to meet the situation that now sents itself. The proposed canal will constitute the connecting link between the at Lakes and the Pacific Ocean. It will give us an outlet by water for our inland merce, thus enabling us to successfully compete with the East. It will give us ontinuous waterway from the Atlantic to the Pacific through the heart of the tinent, thus bringing us into water communication with the entire world.

s a basis for calculation as to the present volume of commerce between the St. ix and the Mississippi River points and the East via the Duluth-Superior Harbor, so-called lake and rail route, we have secured some statistics showing the re- ts and shipments from the Duluth-Superior Harbor as shown in the Annual ort of the Chief of Engineers, United States Army, to the Secretary of War for year ending June 30, 1912, also as shown in the Monthly Summary of Commerce Finance of the United States, and also from the associations of commerce of vari- cities.

stimates given us by shippers, railroads, and other sources of information show the ipts at the Duluth-Superior Harbor for year ending June 30, 1912, to be 9,765,346 . From reliable information it is shown that approximately 60 per cent of the ipts at the Duluth-Superior Harbor come to St. Paul, Minneapolis, and the Minne- Transfer, making 5,859,207 tons to these points. The foregoing figures do not ude lake-and-rail business to St. Paul, Minneapolis, and other river towns from Michigan ports—Chicago, Milwaukee, Manitowoc, Green Bay, etc., which are considerable but for which we have no statistics.

to shipments from St. Paul, Minneapolis, and the Minnesota Transfer to the th-Superior Harbor, it is shown by the report of the Railroad and Warehouse mission of Minnesota, and from other sources, that over 600,000 tons of flour and oximately 400,000 tons of other commodities are shipped from St. Paul, Min- olis, and the Minnesota Transfer to the Duluth-Superior Harbor each year.

the 5,859,207 tons of freight received at St. Paul, Minneapolis, and the Minnesota sfer and 1,000,000 of freight shipped to the Duluth-Superior Harbor, it is fair to ne that 50 per cent, or 3,429,603 tons, would be shipped by way of the proposed at a saving of about 50 cents per ton, making a saving of $1,714,801 annually.

We have no data, nor is it possible to estimate the enormous amount of freight, pa
ticularly general merchandise which, through a lowering of freight rates, would b
brought by way of the proposed canal from the eastern markets on boats which g
east loaded with iron ore and whose owners are very desirous of securing ballast f
return trips at very low rates—i. e., imported and domestic merchandise which no
comes into this market over the railroads from the Southeast and which in the eve
of the proposed canal would come through the Duluth-Superior Harbor, thence b
way of the canal to jobbers and manufacturers of the Northwest.

The proposed canal line from Duluth-Superior Harbor to the Twin Cities on t
Mississippi River is in fact only an extension of the Erie Canal, gathering produc
of the Western States, delivering them at the Duluth-Superior Harbor, to be shipp
by larger boats to Buffalo and to Erie Canal ports.

Maj. Sears in his report recommends a canal of 7 feet draft, but as the Erie Can
is 12 feet deep we would suggest that a canal 10 to 11 feet would be more serviceabl
Barges could often be loaded from large boats direct, thus saving one transfer. The
is no doubt but that the Lake traffic would receive a strong impetus by the buildi
of this canal and the completion of the improvements of the Erie Canal.

FUTURE DEVELOPMENTS.

The immense resources of the St. Croix and the Mississippi Valleys call to mind t
great benefits which would be derived by the construction of this canal. It is w
known that for miles on each side of the St. Croix River the soil is particularly adapt
to the raising of potatoes, grain, and other farm produce, many thousands of carloa
of potatoes being shipped to eastern and southern markets each season. It is als
well-known fact that during the past season the railroads traversing this territory w
incapable of handling the crop, due to lack of cars and other causes. Also it is w
known that the price of potatoes was about 100 per cent higher in St. Louis and ot
Mississippi points than at points on the St. Croix River, due to heavy freight char
and for storage charges while waiting for cars at shipping points. Therefore it wou
not only be of tremendous advantage to the farmers in the territory adjacent to t
proposed canal but also to thousands of families in the Eastern and Southern Stat

The geological survey of the territory adjacent to the proposed canal shows v
deposits of trap rock, which would develop great crushed-rock industries; limero
which would develop limekilns; building stone, which at present lies dormant ow
to lack of cheap transportation facilities; pottery-clay deposits, which would deve
brick industries; filter sand, which is coming into greater use each day, but whic
now left as deposited by nature; silicate sand for glass manufacture; and other ind
tries which would be greatly developed, for the benefit not only of this section
that of the entire Nation.

In compiling the data relating to the proposed Superior-Mississippi Canal,
committee has endeavored to secure the most reliable information possible, and
have therefore referred to the Annual Report of the Chief of Engineers, United Sta
Army, to the Secretary of War for the year ending June 30, 1912. We quote fr
pages 953, 954, and 955 the following, which is pertinent to the question in hand

"It is well known that the railroads strive keenly for the north and south frei
business, make lower rates where there is water competition, cut their rates on cert
commodities, and make sometimes especially low rates for the season of navigati
to be increased during the winter months. This latter practice was common sev
years ago."

Also from the same authority we quote: "It is believed the tonnage of the Dul
Superior Harbor is now exceeded by that of but one port in the United States—
York."

Also from the same authority we quote: "The vessel freight of the Duluth-Supe
Harbor for 1911 was 57 per cent of the amount which passed through the Sault l
the same year."

Also from the same authority: "Improvements of the Duluth-Superior Ha
from 1867 to June 30, 1912, is $6,869,741.02, and the freight received and ship
during same period 365,865,859 short tons, and the market value of the same, $3,8
394,224. From this it appears that the cost of the Government improvements
been about one-sixth of 1 per cent of the value of the freight transported."

In conclusion this committee desires to express its regret that the examinatio
the canal route seems to be confined to the Aminicon and Moose Rivers. We
hoped that your instructions might have been sufficiently broad to permit of
examination of different suggested routes in order to determine the most feasible

If the Aminicon-Moose River route should be found impractical because of insuffi-
ent water supply or serious engineering difficulties, we would ask that you recom-
end an examination of other suggested routes in order to determine their feasibility.
Respectfully submitted.

J. G. Armson,
C. W. Brenner,
H. H. Harrison,
Wm. Smithson, *Secretary*,
W. C. Masterman,
Citizens' Canal Association.

Engineer Office, United States Army
Canal Park, Duluth, Minn., May 14, 1913.

Dear Sir: As it has come to my notice that you are interested in the pending
position for a waterway from Lake Superior to the Mississippi River by various
ites provided for by the river and harbor act approved July 25, 1912, and resolution
the Congressional Committee on Rivers and Harbors under date of January 13,
13, has been made by the board of officers of the Corps of Engineers appointed by
agraph 7, Special Orders, No. 19, War Department, Office of Chief Engineers,
ited States Army, Washington, D. C., August 14, 1912, and that the report submitted
reon is unfavorable to the improvement for the reason that the present railroad rate
freight between the Twin Cities and the Head of the Lakes is less than will be the
t of canal transportation when the cost of extra handling and operation, mainte-
nce, and interest on investment have been added to the Erie Canal rate for an equal
tance.

ou are further notified that all interested persons have the privilege of an appeal
m this conclusion to the Board of Engineers for Rivers and Harbors, a permanent
ly sitting at Washington, D. C., to which all examination and survey reports of this
racter are referred. Persons desiring to do so may be heard on appeal by the board
er orally or in writing. Written communication should be addressed to the Board
Engineers for Rivers and Harbors, Southern Building, Washington, D. C., and
uld be mailed in time to be in the possession of the said board within four weeks
n the date of this communication. If oral hearings are desired, dates for the same
y be arranged for by correspondence with the board.

ou are requested to communicate the foregoing to any persons known by you to
interested in the improvement and who not being known to this office do not re-
ve a copy of this communication.

urther information may be obtained if desired upon application to this office.

y direction of Col. Potter, senior member of the board.

Very respectfully.

E. D. Peek,
Captain, Corps of Engineers, Member of the Board.

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otice of unfavorable report on preliminary examination of various routes for a
erway from Lake Superior to the Mississippi River from the board of Engineer
ers constituted by paragraph 7, Special Orders, No. 19, War Department, Office
ef of Engineers, August 14, 1912, sent to the following:

n. C. B. Miller, M. C.,[1] Washington, D. C.
n. I. L. Lenroot, M. C.,[1] Washington, D. C.
n. Moses E. Clapp, United States Senator,[1] Washington, D. C.
n. Knute Nelson, United States Senator,[1] Washington, D. C.
n. R. M. La Follette, United States Senator,[1] Washington, D. C.
n. Isaac Stephenson, United States Senator,[1] Washington, D. C.
es A. Ferguson, Pittsburgh Coal Co., Duluth, Minn.
A. McGonagle, president of Duluth, Missabe & Northern Railway, Duluth.
B. Woodruff, president of Woodruff Lumber Co., Duluth.
M. Marshall, president of Marshall-Wells Hardware Co., Duluth.
l Hayssen, mayor, Antigo, Wis.
tons Bluff Commercial Club, W. T. Harris, secretary, St. Paul, Minn.

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[1] To these were also given a list of the names of persons to whom unfavorable notice was sent.

Granite Falls Commercial Club, W. L. Kraemer, secretary, Granite Falls, Minn.
St. Paul Board of Trade, W. H. Patton, secretary, St. Paul.
Commercial Club of Richmond, Torah, Minn.
St. Paul Commercial Club, John H. Mitchell, commissioner, St. Paul.
Hastings Commercial Club, A. J. Schaller, chairman, Hastings, Minn.
Board of county commissioners, Washington County, Minn., by H. A. Nelson, county auditor, Stillwater, Minn.
Thomas Wilkinson, president Upper Mississippi River Improvement Association Burlington, Iowa.
D. M. Neill, president of Minnesota Federation of Commercial Clubs, Red Wing.
James Suydam, secretary and manager of Goodyear Rubber Co., St. Paul, Minn.
Commercial Club, Superior, Wis.
James Bardon, East End Station, Superior, Wis.
Railway and Engineering Review, 1305 Manhattan Building, Chicago, Ill.
Duluth News Tribune, Duluth.
St. Paul Daily News, St. Paul.
Stillwater Daily Gazette, Stillwater, Minn.
Duluth Board of Trade, C. F. McDonald, secretary, Duluth.
R. J. Mershon, 1317 West One hundred and fifth Street, Chicago, Ill.
Wendell A. Anderson, La Crosse, Wis.
President, Chicago, Milwaukee & St. Paul Railway, Chicago, Ill.
Red Wing Commercial Club, J. F. Merrill, secretary, Red Wing, Minn.
Moline Business Men's Association, C. F. Grantz, secretary, Moline, Ill.
Muscatine Commercial Club, E. A. Ogilvie, secretary, Muscatine, Iowa.
E. M. Schmidt, mayor, Wabasha, Minn.
F. H. Little, chairman of River Traffic Improvement Commission, Muscatine, Iowa
Mayor, South St. Paul, Minn.
Village president, Taylors Falls, Minn.
R. Wellisch, St. Paul, Minn.
Business Men's League, W. X. Folsom, president, Taylors Falls, Minn.
E. F. Ganz, Alma, Wis.
A. P. Pierce, Red Wing, Minn.
Quincy Chamber of Commerce, C. F. Perry, secretary, Quincy, Ill.
Mayor, Duluth, Minn.
Eau Claire, Wis., Commercial Association, J. P. McAnulty, secretary, Eau Claire.
Mayor, Hastings, Minn.
Mayor, La Crosse, Wis.
Galena Business Men's Association, L. T. Le Bron, jr., Galena, Ill.
Ashland Advancement Association, David Murray, secretary, Ashland, Wis.
Board of Trade, F. J. Carr, president, Hudson, Wis.
Telegraph Herald, Dubuque, Iowa.
Duluth Commercial Club, H. V. Eva, secretary, Duluth.
President of Great Northern Railway, St. Paul.
Duluth Herald, Duluth.
Superior Telegram, Superior.
Howard Elliott, president of Northern Pacific Railway, St. Paul.
H. H. Harrison, Stillwater, Minn.
Frank J. Waterous, St. Paul.
J. G. Armson, Stillwater, Minn.
Hon. F. C. Stevens, M. C.,[1] St. Paul.
President Duluth, South Shore & Atlantic Railway, Marquette, Mich.
Marine Review, Cleveland, Ohio.
S. A. Thompson, 312 North Eleventh Street, Richmond, Ind.
New York Marine Journal, New York.
Government Advertiser, Washington, D. C.
William Livingstone, president of Lake Carriers' Association, Detroit, Mich.
George L. Reiss, Minnesota Steel Co., Duluth.
E. H. Gary, chairman of United States Steel Corporation, New York.
M. M. Gasser, Duluth.
Army and Navy Journal, Washington, D. C.
Army Register, Washington, D. C.
Improvement Bulletin, Minneapolis, Minn.
J. H. Barnes, treasurer of Ames Brooks Co., Duluth.
Z. D. Scott, vice president of Scott Graff Lumber Co., Duluth.
Capt. Alexander McDougall, Duluth.

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[1] To these were also given a list of the names of persons to whom unfavorable notice was sent.

mmercial Club, New Duluth, Minn.
orge H. Mold, Sunrise, Minn.
mmercial Club, Rush City, Minn.
F. Druar, consulting engineer, Oscar Clausseen Engineering Co., 514 National
erman American Bank Building, St. Paul.
arles Ekdahl, Otisville, Minn.
nnesota Railroad and Warehouse Commission, St. Paul.
C. Volk & Co., Duluth, Minn.
y Land Co., Duluth, Minn.
agon Refining Co., Toledo, Ohio.
Paul Association of Commerce, J. H. Beek, general secretary, St. Paul, Minn.
P. Trickett, traffic manager of Civic and Commerce Association, Minneapolis.
am Shovel and Dredge Journal, 105 West Monroe Street, Chicago, Ill.
H. Salter, Columbia Building, Western Railway Weighing Association, Duluth,
inn.
nnesota Linseed Oil Co., Minneapolis.
Tilburg Oil Co., Minneapolis.
thwestern Fuel Co., St. Paul.
sburgh Coal Co., St. Paul.
kson Coal & Dock Co., St. Paul.
J. H. Davidson, St. Paul.
tor of Northwestern Miller, Minneapolis.
tor of Minneapolis Tribune, Minneapolis.
tor of Minneapolis Journal, Minneapolis.
tor of Daily News, Minneapolis.
tor of St. Paul Dispatch, St. Paul.
tor of St. Paul Pioneer Press, St. Paul.
rge M. Hazzard, president St. Croix River Improvement Association, St. Paul.
t. Chas Campbell, 424 Second Avenue, South Minneapolis.
hwestern Consolidated Milling Co., Minneapolis.
hburn Crosby Co., Minneapolis.
sbury Flour Mills Co., Minneapolis.
enix Milling Co., Minneapolis.
onal Milling Co., Minneapolis.
dental Milling Co., Minneapolis.
ge C. Christian Milling Co., Minneapolis.
iam de la Barre, St. Anthony Falls Water Power Co., Minneapolis.
kfus Steamboat Line, Minneapolis.
. W. A. Blair, steamer *Morning Star*, Davenport. Iowa.
. Samuel R. Van Sant, Minneapolis.
. George Winans, St. Paul.
or of St. Paul.
or of Minneapolis.
. Crocker, Minneapolis.
or of St. Croix Falls, Wis.
or of Stillwater, Minn.
or of Hudson, Wis.
or of Lake City, Minn.
or of Red Wing, Minn.
or of Prescott, Wis.
or of Alma, Wis.
or of Winona, Minn.
or of Fountain City, Wis.
or of Prairie du Chien, Wis.
r of Dubuque, Iowa.
r of Rock Island, Ill.
r of Davenport, Iowa.
iam Smithson, Stillwater, Minn.
or of Star Observer, Hudson, Wis.
r of True Republican, Hudson, Wis.
e H. Sullivan, Stillwater, Minn.
ard Oil Co., Minneapolis, Minn.
e E. Wilson, vice president of Northwestern Thresher Co., Stillwater, Minn.
nnati Chamber of Commerce, Cincinnati, Ohio.
go, St. Paul, Minneapolis & Omaha Railway, St. Paul, Minn.
ern Weighing and Inspection Bureau, Minneapolis, Minn.

President of Minneapolis, St. Paul & Sault Ste. Marie Railway, Minneapolis.
C. W. Gardner, comptroller of Soo Railway, Minneapolis.
H. A. Gray, comptroller of Northern Pacific Railway, St. Paul.
C. Jensch, auditor of Omaha Railway, St. Paul.
Commercial Exchange, Burlington, Iowa.
La Crosse Board of Trade, La Crosse, Wis.
Minnesota Waterways Commission, A. L. Crocker, chairman, Minneapolis.
Winona Association of Commerce, Winona, Minn.
John Deary, Dubuque, Iowa.